Ref 71F

Unasylva

AN INTERNATIONAL REVIEW OF FORESTRY AND FOREST PRODUCTS

VOLUME 15, NUMBER 3, 1961

Unasylva

1961 - Volume 15 Number 3

U.S.S.R. Forest Resources and Features of their Inventory 119

P. V. Vassiliev

Preparation of Inventories of Tropical Forest Plantations 125

F. Loetsch

New Designs for Fuelwood Cooking Stoves 131

H. Singer

What Should a Basic Forest Law Contain? 140

T. François

Commodity Report

Utilization of Small-sized Roundwood 153

The Work of FAO

European Forestry Commission 156

Study Tour in France and the United Kingdom 158

Silviculture on Farm Forests 158

Equipment Section 159

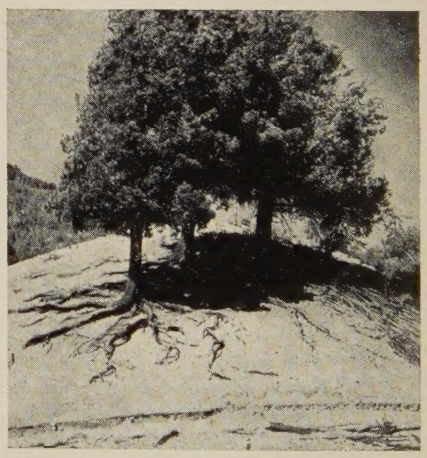
News of the World 162

Annual Subscription: U.S. $2.50 or 12s. 6d.
Single copy: U.S. $0.65 or 3s. 3d.

Rates can be paid in local currencies when orders are placed through the authorized sales agents listed on the back cover.

FAO — The Food and Agriculture Organization of the United Nations — grew out of a United Nations Conference held at Hot Springs, Virginia, U.S.A., in May 1943. The nations agreed to work together to secure a lasting peace through freedom from want. The Organization was formally founded at Quebec, Canada, in October 1945. It was located at Washington D.C. until 1951 when the Headquarters office was moved to Rome.

Unasylva is prepared by the Forestry and Forest Products Division (Director, Egon Glesinger; Editor, Leslie J. Vernell) and published quarterly. It attempts to cover a range of interest which is as wide as that of the Division whose work it mirrors. Signed articles express the opinions of the authors and do not necessarily represent the views of the Organization. All material in ***Unasylva*** may be freely reprinted, but acknowledgment is requested, together with a copy of the publication containing the reprint.



Cover photograph. *Examples of Patagonian cypress* (Libocedrus chilensis) *of Chile and Argentina, showing their powerful roots which stretch quite often up to 20 meters from the foot of the tree and up to 4 meters in depth. It gives a striking demonstration of the conservation role which these trees play in the loose soils of the Patagonian region; when these last examples disappear the excessive wind and lack of water, typical of that extensive region of Chile and Argentina, will produce an immediate advance of the desolate steppe.*

Courtesy, Lucas Tortorelli

Unasylva

An International Review of Forestry and Forest Products

FORESTRY MEETINGS IN THE AMERICAS

In the course of the first session of the North American Forestry Commission, the Mexican Government awarded the " Miguel Angel de Quevedo " medal for merit in the field of forestry to the heads of the United States and Canadian delegations and to the Deputy Director of FAO's Forestry and Forest Products Division. From left to right: Dr. Enrique Beltrán, Under-Secretary of Forest Resources and Wildlife; Sir Henry Beresford-Peirse, FAO; Ing. Julián Rodríguez-Adame, Minister of Agriculture and Livestock of Mexico; Dr. J.D.B. Harrison, Deputy Minister of Forestry, Canada; Dr. Richard McArdle, Chief, Forest Service, U.S. Department of Agriculture.

THE FIRST session of the newly-formed **North American Forestry Commission** was held at Mexico City from 24 to 29 July 1961. This commission is the latest among six similar regional forestry bodies — in Europe, Africa, Latin America, Asia and Pacific, and Near East — which now cover the entire membership of FAO.

Delegates from the three member countries — Canada, Mexico and the United States of America — which make up the North American Forestry Commission, discussed broad problems of forest policy of common concern, including international measures to combat and control forest insect pests and diseases, mutual programs of forest fire prevention and attack, and international trade in forest products.

Progress achieved in FAO's series of regional timber trends studies, undertaken in co-operation with the United Nations regional economic commissions, was reported and agreement reached on preparing a similar study for North America. The first, *European timber trends and prospects*, which appeared in 1953, is now being revised; the second, *Timber trends and prospects in the Asia-Pacific region*, has just been published; a third is under way covering Latin America, including Mexico; while a fourth has just been initiated in Africa. A world picture is planned to be presented to the next world forestry congress in 1965.

Earlier in the year the first meeting had been held of the Governing Council of the **Latin-American Forest Research and Training Institute,** Mérida, Venezuela. After four years on a temporary basis as a technical assistance project of FAO, the institute has now achieved permanence and independence as the result of a multilateral agreement between FAO, the Government of Venezuela, and ten member countries of FAO.

Shortly after the Mexico meeting, from 13 to 26 August, FAO convened a second **World Eucalyptus Conference** in São Paulo, Brazil. In Brazil, close to half a million hectares have been planted with eucalypts to stock new areas with fast-growing species, originally for fuelwood supplies. So the choice of São Paulo as the site of the conference was most suitable.

Coming five years after the first of the series held in Rome in 1956, the conference provided an opportunity for discussing both the advantages and the disadvantages of eucalypts, and for reviewing progress achieved in such fields as research, silviculture and utilization. A hundred years ago, eucalypts were virtually unknown outside Australia. Now, owing to their adaptability and versatility, their introduction has spread to every part of the world.

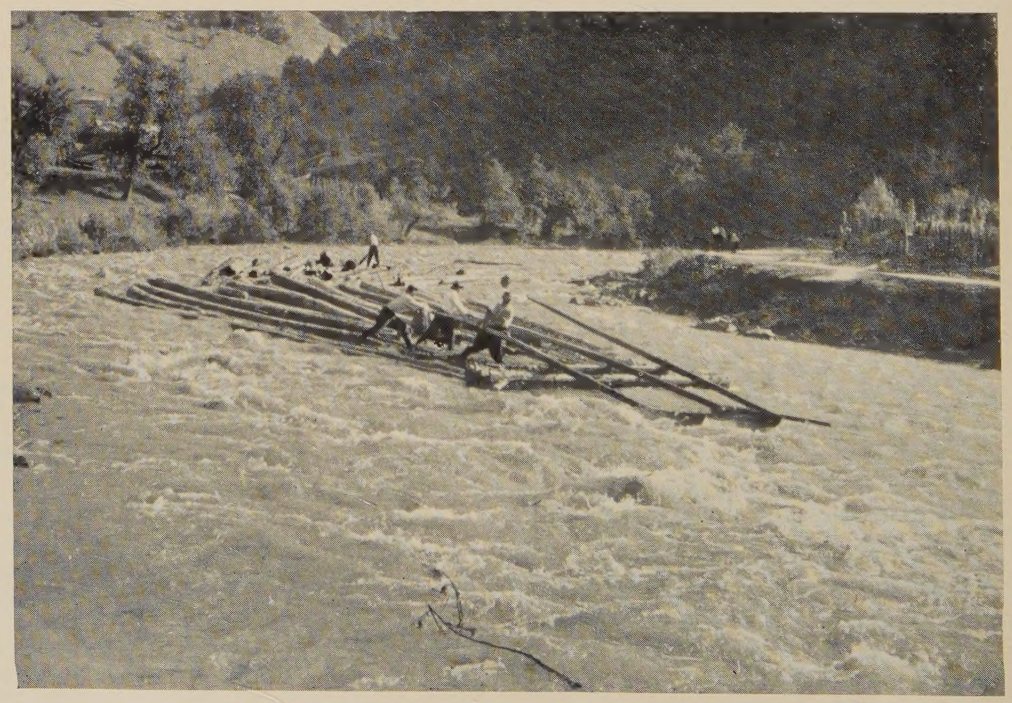
Australia is still the most important source of seed supply for other countries. The Government has made a most valuable proposal to set up a Certified Eucalyptus Seed Collection and Distribution Service as one of Australia's contributions to the FAO Freedom from Hunger Campaign.

FIGURE 1. – *In the national economy of the U.S.S.R., planes of the civil air force are used for a variety of jobs: photography, seeding of forests, spreading mineral fertilizers, geological exploration, and fire fighting. This photo shows a helicopter from the air base for forest fire protection flying over the taiga (eastern Siberia).*

Official U.S.S.R. photo

FIGURE 2. – *Log transport on the Belaia Tissa river in the Rakhof forest district (Transcarpathia region).*

Official U.S.S.R. photo



U.S.S.R. Forest Resources and Features of their Inventory

P. V. Vassiliev [1]

The work undertaken by FAO since the war on the statistics of world forest resources is of exceptional importance. The results of the first three world forest inventories published by FAO during this period have, for the first time, provided foresters of different countries with more or less reliable information on the area, reserves and composition of the world's forest resources. In these days, with the steady internationalization of science and with international co-operation continuously increasing, published information about the forest resources of different countries is valuable not only to economists but also to a wide range of workers in forestry, agronomy, geography, botany and other branches of natural science. This makes it all the more important, both that the published data should reflect the actual extent and composition of the forest resources in particular countries as accurately as possible, and that the data of the different countries should be easily comparable. It has to be remembered that the ordinary forester of any country studying the statistics of forest areas and forest reserves of a foreign country tends to interpret those data on the basis of the statistics for his own country, with which he is familiar.

Nevertheless, we are still far from having reached that degree of international unification of data of forest resources which would make it possible reliably to summarize and compare the data from different countries. This is mainly because of the absence of uniform (or at least reconcilable) methods of economic classification of forest areas and forest reserves. Another factor which may have a great bearing on the comparability of similar categories of forest data in different countries is the method used for determining those categories. Failure to understand the specific nature of the national forest inventory can often lead to serious errors when national data are summarized in a world inventory report.

Some ideas and suggestions for improving existing world forest statistics are put forward later in this paper. The current situation is first illustrated by a concrete example: the inventory of forest resources in the U.S.S.R., and the data for the U.S.S.R. included in *World forest inventory 1958* (FAO, 1960).

[1] Professor P.V. Vassiliev is head of the Forest Resources Section of the Board for Investigating Productive Forces at the U.S.S.R. Academy of Science.

A basic feature of forest statistics in the U.S.S.R. is the distinction drawn between:

a) the total area of the forest reserve lands;
b) the forest area; and
c) the forested (or forest-covered) area.

Failure to grasp the significance of this distinction usually leads to misunderstandings and errors on the part of foresters outside this country (as well as by those inside this country not specialized in forestry).

The *total area* of the forest reserve lands (also called the total area of the *Goslesfond*) is the total area of all types of land and water in the charge of the state forestry service or under its control. It consists of (*a*) the forest area, and (*b*) the nonforest area. The nonforest area consists of lands which, though in the charge or under the control of the state forest service, are not intended or are unsuitable for the growing of forests. These include (i) areas of different nonforest lands (arable land, grassland, pasture, water, and so forth); (ii) areas used for various general economic purposes (roads, cuttings, canals, farms, etc.); (iii) areas of nonexploited lands (swamps, sands, ravines, sharp slopes, rocks, etc.). The forest area forms the main part of the total area of the forest reserve.

The *forest area* is the area of lands actually covered by forests and intended for forest growing. This likewise consists of two parts: the forested area and the area not covered by forests. The latter includes lands suitable for the growing of forest but not presently covered by forest, e.g., burnt-cut areas, areas under dead stands, cutovers which have not yet regenerated, waste lands, clearings and sparse forest areas. The forested area is the main part of the forest area.

The *forested area* (or forest-covered area) is the area of lands presently occupied by forests (including shrubs).

The areas of these several categories, according to the U.S.S.R. inventory of 1 January 1956, are as follows:

	thousand hectares
Total area of the forest reserve lands	1,131,116
Nonforest area	295,424
Forest area	835,692
Area not covered by forest (open area)	113,423
Forested (or forest-covered) area	722,269

Full details of the composition of the nonforest area and of the open area are given in references books on the U.S.S.R. forest reserve.

The first of these categories — the total area of the forest reserve lands — is, as far as is known, peculiar o the U.S.S.R. It did not exist in prerevolutionaryt Russia. It reflects the classification of lands in the U.S.S.R., and in particular the absolute predominance of state landownership.

As may be seen from the above figures, this total area of forest reserve lands includes over 295 million hectares of nonforest area. It is not the total area of forest reserve lands, therefore, which should be compared with the total forest areas of other countries in reports on world forest resources. The more appropriate figure, and the one most comparable, is the forest area (actually 835,692,000 hectares). This is the figure which corresponds most nearly to the figures of forest area published by other countries, and it is from this figure that one should proceed in determining the forest area of the several regions and of the world as a whole. In fact the category total area of forest reserve lands (1,131,116,000 hectares) is never used in the U.S.S.R. to characterize forest resources in the country's forest statistics. Clearly it cannot be used as a basis for determining such parameters as forests as a percentage of land area, average growing stock per hectare or net growth per hectare.

The forest area (835,692,000 hectares) is divided, according to the form of management, into

a) centrally managed forests, i.e., those directly in the charge of the forestry service;

b) granted forests, i.e., those ascribed to other administrative bodies, scientific institutions, etc. (5,797,000 hectares); and

c) collective farm forests, i.e., those granted (together with lands) in perpetuity to collective farms (39,226,000 hectares).[1]

Within the limits of each form of management the forest-covered areas are distinguished and the forests growing on these areas are inventoried according to the sizes of the areas, their timber reserves and the prevalence of coniferous or broadleaved types.

The division of the centrally-managed forests into three groups according to their national economic significance is of major importance in the inventory of the forest resources of the U.S.S.R. This division has been discussed several times already and therefore we shall content ourselves here with a very brief account.

[1] Somewhat different figures of the area of collective farm forests have been published in Soviet forestry literature from time to time. For example, both in *Forest Economy* No. 1, 1953 and in No. 3, 1958, a figure of over 90 million hectares was given for collective farm forests. This higher figure included an area of over 50 million hectares of reindeer pasture, sparsely forested, in the belt bordering the tundra. In the present paper these areas are regarded as agricultural lands rather than as forest areas and have therefore been excluded from the figure for collective farm forests.

Group I includes green zones, forests protecting fields and soils, small ranges of forests (*kolki*) in the steppes, forests in resort areas, restricted shelter belts along rivers, railways, highways, around lakes and reservoirs, shelter belts bordering the tundra, etc.

Group II includes forests of economic and general water conservation importance growing in forest-scarce regions.

Group III includes all other forests. It is in the forests of this third group that the main activity of the logging industry takes place.

The areas of the forests of these three groups, as of 1 January 1956, are given in Table 1.

TABLE 1. – CLASSIFICATION OF CENTRALLY-MANAGED FORESTS

Forest groups	Total area of forest land		Forest area		Forest covered area	
	1,000 ha.	%	1,000 ha.	%	1,000 ha.	%
Group I	30 507	2.8	24 706	3.1	19 428	2.9
Group II	83 792	7.7	72 409	9.2	62 497	9.2
Group III	969 995	89.5	693 554	87.7	599 028	87.9
TOTAL	1 084 294	100	790 669	100	680 945	100

For each group special procedures for forest utilization have been established.

Should the national economic significance of any particular forest range change, it is transferred from one group to another. In fact, a number of transfers have taken place recently, so that, for example, the area of the first group has more than doubled, while that of the second group has also grown considerably. These changes, which show the process of intensification of the country's forest economy, will be fully reflected in the new inventory data to be published shortly.

Recently, in the forest inventory, a distinction has been drawn in the forests of centralized management between forests-in-use (exploited forests) and unexploited forests (those reserved). The unexploited forests are the forest ranges situated at a considerable distance from main transport lines and not intended for development during the next 20 years. It will be recalled that the forest area of the centrally-managed forests is 790,669,000 hectares. Of this area 413,520,000 hectares are in use, the remainder being unexploited, or reserved, forests. The entire forest area of the granted forests (5,797,000 hectares) and of the collective farm forests (39,226,000 hectares) is regarded as being in use, so that the total area of exploited forests in the U.S.S.R. amounts to 458,543,000 hectares. Unexploited forests, or reserved forests, amount to 377,149,000 hectares, and lie entirely in the centrally-managed forests.

Of the 458,543,000 hectares of exploited forests, however, no less than 60,625,000 hectares consist of open areas, so that the forested area of exploited forests is no more than 397,918,000 hectares, of

which, as may be seen from Table 2, 277,025,000 hectares consist of mainly coniferous forest.

A re-inventory of the forests, as of 1 January 1961, is presently in progress, and though this re-inventory may lead to a number of minor changes and corrections, it is not expected that the general picture summarized in Table 2 will undergo serious modification.

TABLE 2. – U.S.S.R. FOREST RESOURCES: FOREST AREA AND FOREST AREA IN USE

Category	Total area	Area in use	Unexploited area
	..... *Thousand hectares*		
1. FOREST AREA			
Centrally-managed forests (state forest reserves)	790 669	413 520	377 149
Granted forests (in charge of different organizations)	5 797	5 797	—
Collective farm forests	39 226	39 226	—
TOTAL	*835 692*	*458 543*	*377 149*
Of which			
Open areas (area not covered by forest)	113 424	60 625	52 799
Forested (forest-covered) area	722 268	397 918	324 350
Of which:			
Mainly coniferous	560 198	277 025	283 173
Mainly broadleaved	162 070	120 893	41 177
	..... *Million cubic meters*		
2. TOTAL TIMBER STOCK			
Centrally-managed forests (state forest reserves)	75 090	40 018	35 072
Granted forests (in charge of different organizations)	473	473	—
Collective farm forests	2 322	2 322	—
TOTAL	*77 885*	*42 813*	*35 072*
Of which:			
Coniferous	66 858	34 610	32 248
Broadleaved	11 027	8 203	2 824
3. TOTAL STOCK OF MATURE AND OVERMATURE FORESTS	54 815	26 750	28 065
Of which:			
Coniferous	49 351	23 186	26 165
Broadleaved	5 464	3 564	1 900

As yet the productivity of the forests of the U.S.S.R., especially that of the unexploited forests, has been insufficiently studied. The Soviet forest survey service and management organization mostly use, as indicators of the productivity of the country's forests, figures of average standing stock or of annual average growth per hectare of forested area. Investigations are presently being carried out on methods of determining the common index of current growth. The average growth in the U.S.S.R. is determined as the relation of the volume of the standing stock (exluding natural losses and shifting cultivation) to the age of the stand. The current growth is determined as the relation of gross increment (including natural losses as well as shifting cultivation) for the period of 5 or 10 years to that period.

Both are measures of average annual increment. However, our "average growth" in its essence is close to the international "net increment"; this can also be zero, or even negative, in overmature forest. Current data on standing stock and growth per hectare are given in Table 3.

TABLE 3. – STANDING STOCK AND GROWTH IN THE U.S.S.R.[1]

	Unit	All ests	Forests-in-use	Unexploited forests
Forest area	million ha	835.7	458.5	377.2
Forested area	million ha	722.2	397.9	324.3
Total standing stock	thousand million m^3	77.9	42.8	35.1
Standing stock per hectare of forested area:				
All forests	m^3	108	107	108
Coniferous	m^3	119	125	114
Broadleaved	m^3	69	68	69
Standing stock per hectare of forest area:	m^3	93.2	93.4	93.1
Total annual growth	million m^3	858.6	671.2	187.4
Annual growth as percentage of standing stock	percentage	1.10	1.57	0.53
Average growth per hectare of forest area	m^3	1.03	1.5	0.5
Average growth per hectare of forested area	m^3	1.2	1.7	0.6

[1] The indices of growth relating to both forests-in-use and unexploited forests are unofficial.

The data derived from the U.S.S.R. forest inventory and set out in Tables 2 and 3 do in fact contain the same elements as are contained in the international statistics published by FAO. However, comparable categories arise in different connections and sometimes have different names; in several cases correspondence is not complete. The situation can best be understood by reference to the schematic diagram (Figure 3), in which the forest classification adopted in the U.S.S.R. forest statistics is compared with that used in FAO's statistics. Here it is possible to pick out the categories which correspond in the two classifications. At the same time it will be observed, as will appear from the following notes, that the correspondence is not exact at all points.

First, it will be observed that the nonforest area of the U.S.S.R. (i.e., lands which, though in the charge or under the control of the state forest service, are not intended or are unsuitable for the growing of forests.

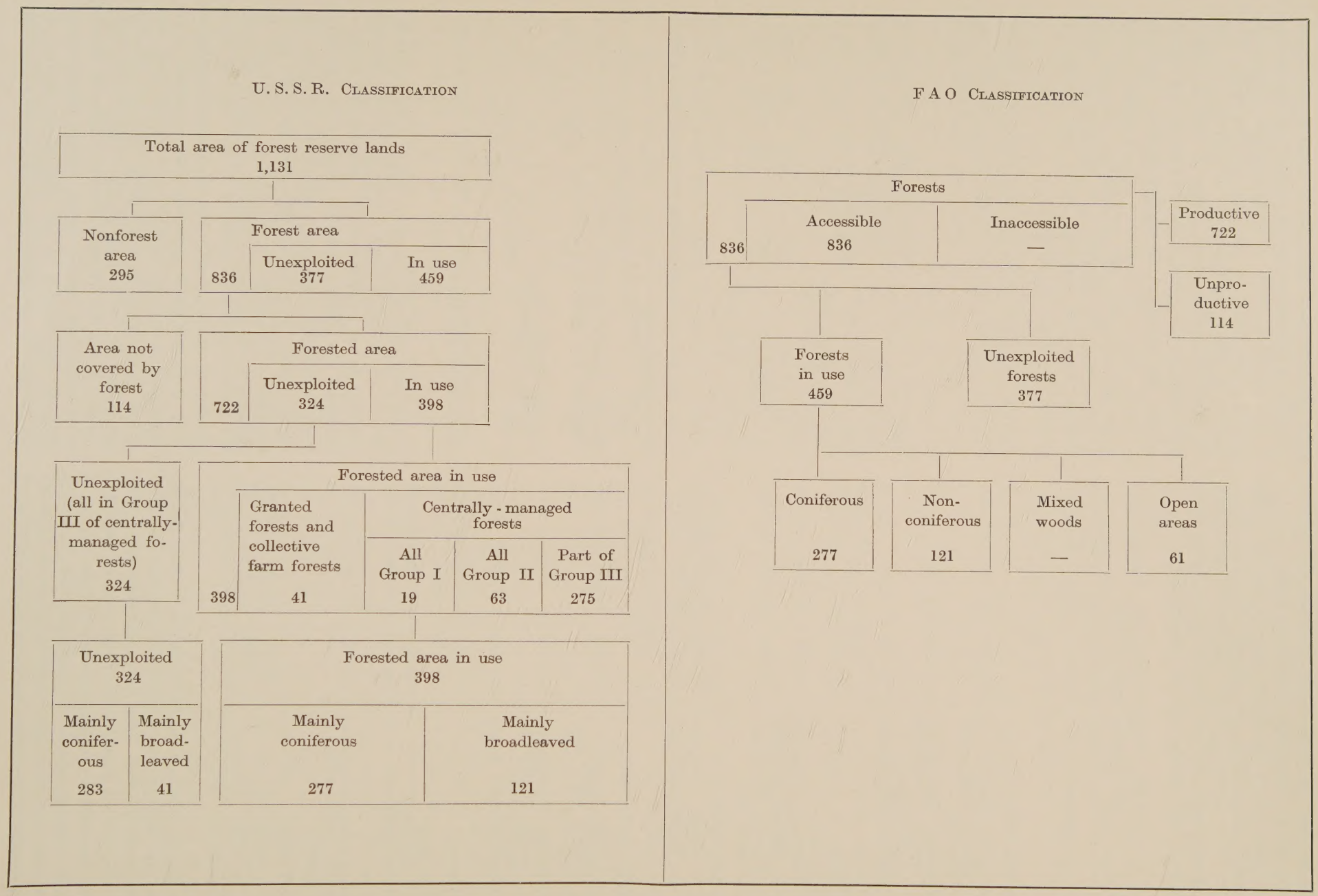


Figure 3. - *Distribution of the forest areas in the U.S.S.R. (in million hectares)*

these amount to 295 million hectares) has no counterpart in the FAO statistics and is therefore excluded from the FAO diagram. The forest area is the true index of the territorial extent of the forests, and it is this figure which corresponds to the basic figure in the international classification.

Next, it should be noted that in the inventory data available on 1 January 1956 relating to the U.S.S.R. forest resources, inaccessible forests are not singled out. Inaccessible forests do exist in the U.S.S.R., occupying small areas in the Caucasus, the Urals, Siberia and the Far Eastern regions.

Nor is a distinction drawn between productive and unproductive forests. In a very broad sense, however, the distinction which is drawn between forested area and nonforested area can be taken as corresponding roughly to the FAO distinction between productive and unproductive forests. (See definition of nonforested area given above.)

Forests-in-use and unexploited forests have identical meanings in both classifications.

As to the species classification, the U.S.S.R. statistics distinguish only mainly coniferous and mainly broadleaved; there is no mixed woods category.

With the aid of Figure 1, and taking into account the foregoing observations, it now becomes possible to enter accurate figures for the U.S.S.R. in the FAO tables.

Unfortunately, when the third world forest inventory was compiled, neither the Soviet forest economists, nor the FAO compilers were able to carry out a detailed reconciliation of the U.S.S.R. and FAO classifications. As a result, both the *World forest inventory 1958* (issued in 1960) and the summary thereof published in *Unasylva* Volume 14, Number 3 contain serious and regrettable errors. Thus, for example, forest area was given not as 835,692,000 hectares (the correct figure) but as 1,131,116,000 hectares — which is, in fact, the total area of forest reserve lands and which includes 295,434,000 hectares of nonforest area.

Similarly, errors occurred in presenting the U.S.S.R. data on area and stock of exploited forests. The area of forests-in-use was given correctly, at 458,543,000 hectares. The figure given for timber stock (69,847 million cubic meters), however, did not relate to the area of forests-in-use but to the area of another forest classification group, peculiar to Soviet statistics, namely, the so-called forests of industrial utility.[2] Forests of industrial utility, in Soviet statistics, include most of the Group II and Group III forests (see Table 1). They amount to 636,629,000 hectares (rather less than the total of Group II and III, which is 765,964,000 hectares), and their stock is reckoned at 69,847 million cubic meters, of which 61,043 million cubic meters are coniferous and 8,804 million cubic meters broadleaved.

Perhaps because the significance of these two figures was not fully explained in translation, they were erroneously connected in compiling. Dividing the stock by the area of forests-in-use gave the following results: 152 cubic meters per hectare for all forests, 168 cubic meters per hectare for coniferous forests and 81 cubic meters per hectare for broadleaved forests. However, as explained, the above-mentioned figure for timber stock relates to an area much larger than that of forests-in-use. The actual timber stock in forests-in-use, as indicated in Table 2, is 42,813 million cubic meters, of which 34,610 million cubic meters are coniferous and 8,203 million cubic meters broadleaved. Calculating timber stock per hectare of forested area in use we arrive at the following indices: 107 cubic meters per hectare all types, 125 cubic meters per hectare coniferous and 68 cubic meters per hectare broadleaved.

It is clear that the wrong basis of calculation adopted for the U.S.S.R. figures has led to very serious errors. In the case we have just discussed, the published figure for standing stock per hectare of forests-in-use is 152 cubic meters (all types), whereas the correct figure is 107 cubic meters. The total standing stock of forests-in-use should be 42.800 million cubic meters, as against the published figure of 69.800 million cubic meters. The growth figures, too, need correction. The figures for gross increment per hectare in forests-in-use published in the *World forest inventory 1958* are 1.9 (all types), 1.9 (coniferous) and 1.7 (broadleaved). The correct figure for average growth per hectare of forests-in-use is 1.7 cubic meters (all types). The corresponding figure for unexploited forests is 0.6 cubic meter, and for all forests taken together 1.2 cubic meters.

Since Soviet forests comprise a considerable part of total world forest resources, the inclusion of exaggerated data concerning the U.S.S.R. in the general tables has led to considerable errors in the world totals and averages. No doubt FAO will wish to carry out the appropriate revisions to these tables based on the information given in this article.

In conclusion, we should like to make a few suggestions for improving and developing world forest statistics. Obviously this problem is connected in the first place with the existing level and system of forest inventory presently in use in each country. The system of summary inventory adopted by FAO, and the way in which the data are published, are in our opinion quite satisfactory, and we believe that at this stage attention should be concentrated on eliminating those gaps in the summary tables which arise either from the absence of certain data for particular countries or from the lack of comparability of data between countries. Thus the solution of this part of the problem depends largely on securing an improvement in national forest inventory systems.

Forest statisticians in the U.S.S.R. are also confronted with these problems, and we are giving our attention to them. We believe that for the further development and improvement of our system of inventorying resources we must study the possibility of introducing a number of indices presently used in world forest statistics, such

[2] The similarity between the FAO term "forests of exploitable value" and the U.S.S.R. term "forests of industrial utility" probably misled the compilers of the U.S.S.R. data.

as annual gross increment and net growth for different species, classification of forests by density of stands, etc.

But we believe too that, along with supplying FAO with better inventory data in accordance with the existing list of indices, it is also necessary to consider ways and means of expanding this list and of improving the system of summary inventory. In particular, we consider that special attention should be given to problems of, and indices reflecting, the intensity of the forest economy. The *World forest inventory 1958* contains practically no data to show the level of intensity of the forest economies of different countries.

Concerning this problem we suggest that consideration should be given to the possibility of introducing the following indices:

1. The area of artificially reproduced and created forests to be included in forests-in-use.
2. The area of tree plantations which have not yet reached the age when the crowns interjoin and have not yet become part of the forest reserve available in the inventory year.
3. The area and output of existing forest nurseries and forest schools producing marketable tree seedlings in the year of the inventory.
4. The quantity of tree seed collected during the inventory year.
5. The number of man-days spent during the inventory year on all types of forest work (other than industrial timber logging). In the absence of direct records this information can easily be arrived at on the basis of information concerning wages paid to forest workers.
6. Length of forest roads: total length and length per 100 hectares of forest area.

Data relating to all these categories of information (except 6 - length of forest roads) are systematically compiled in the U.S.S.R. every year.

Even if these data cannot be obtained for private forests, it would probably be advisable to start collecting and analyzing them for the public forests.

There is another group of indicators, forest economic indices, which in our opinion would be well worth including in world forest statistics. Here the main difficulty, of course, is the complications which arise in attempting to present cost, price and value data on a comparable basis. However, FAO has already acquired considerable experience in evaluating forest production, and if this experience can be successfully applied to the calculation of incomes and expenditures in the forest economy we believe it would be advisable to try to introduce the following indices (even if they relate only to the public forests):

1. The average (national) marketable stumpage value for the main species of industrial timber.
2. Total income from the utilization of forests (except revenues from the industrial logging of the forests).
3. Expenditures on the forest economy (except expenditures on industrial logging).

These suggestions, if they are to be considered for inclusion in the next world forest inventory, will of course require thorough preliminary study at a forthcoming session of the FAO/ECE Joint Working Party on Forest and Forest Products Statistics or at a specially convened meeting. It is our conviction that a further improvement of world forest statistics along the lines we have suggested will meet with general approval and support.

Editor's note

We welcome Professor Vassiliev's frank and lucid account of the differences in classification between the U.S.S.R. forest statistics and those collected by FAO for the world forest inventory and published in the World forest inventory 1958. *The corrections needed in the U.S.S.R. figures, to which Professor Vassiliev has drawn attention, will lead to considerable revision in the world totals and averages published in the foregoing publication and in* Unasylva, *Volume 14, Number 3. Revised summary tables are now being prepared, and will be published in the next issue of* Unasylva.

We are particularly happy to note that it is intended to adapt the U.S.S.R. forest statistics in certain respects to bring them into close correspondence with those published by FAO. Professor Vassiliev's suggestions for further improving world forest statistics will be formally submitted for the consideration of the expert group which will be convened to advise FAO on drawing up the questionnaires for the fourth world forest inventory, due to be taken in respect of the year 1963.

Preparation of Inventories of Tropical Forest Plantations

Application of Mean Tree Tariffs[1]

F. Loetsch
FAO Technical Assistance Officer

In the tropics over the last decade extensive areas have been planted with fast-growing species such as *Pinus* spp., *Albizzia* spp., *Acacia decurrens*, *Eucalyptus* spp., and this trend is likely to gain in importance in the future. The simplification of the management of such stands with short rotations (8 to 30 years) is a problem awaiting solution.

These forests can be perpetuated either by artificial planting or — as with mangrove or bamboo forests — by natural regeneration. The simplest way of ensuring sustained yields is the well-known age-class method, with area and age-class plus possibly site-class as the only regulatory factors. If the forests are regularly treated and thinned and therefore more or less even-aged and uniform in structure and volume, this method is quite satisfactory.

But for various reasons, the structure of the plantations is often far from the normal (no thinning at all up to the mature age or overthinning by serious illicit cutting, are the extreme situations). It is obvious that yield regulation by area for such forests will result in unequal annual cuts which will completely upset the production schedules of the industries dependent on them. For the most part the forests are being established to supply pulp and paper mills, as in Indonesia, for which a regular sustained supply of raw material is essential.

In Indonesia, the foresters based their estimations of the volume to be expected from mature plantations on the fairly reliable yield tables which were fortunately available for some of the fast-growing species. The deviations from normality (degree of stocking) were either judged ocularly or measured by sample plots. A reliable visual assessment of the degree of stocking needs a high standard of skill. According to the author's experience in Saxony, it is easier to estimate directly the standing volume per area unit than the degree of stocking in relation to a yield table, because the deviation from normality is produced by a number of factors. Also the number of sample plots necessary for obtaining a reliable estimate of the degree of stocking is almost the same as for a direct estimate of volume without the use of yield tables. Another point of even greater importance: the site-class necessary for using the yield table has to be obtained from age and top height.[2] Height measurements are time consuming and, especially in mountainous areas like those of Java, are often a source of serious error.

All these considerations led the author to the conclusion that a simple method for making volume estimates must be found which needs neither height measurements nor the use of a yield table and is based upon only two elements: diameter at breast height (d.b.h.) and number of trees per unit area. The most suitable seemed to be the "mean tree tariff" method.

Krenn, who first developed such mean tree tariffs, in 1948 pointed out the following facts in his booklet *Tarife zur Massenberechnung von Beständen* (Tariffs for the computation of the total volume of stands). First, in regard to European species, the curves drawn for age-classes and for site-classes respectively, giving "diameter over volume" and "diameter over height," diverge in the form of a curved wedge with increasing diameters; secondly, for application in practice, this extent of variation can be taken into account by computing a middle tariff (M) and two other tariffs, an upper and lower one, each differing by 12 percent from the middle tariff for a given girth. Which of the three tariffs should be used for the specific selected mean tree of a stand must generally be decided by visual assessment of the average height range.

Krenn was thus able to dispense with exact height measurements and the drawing of height curves in connection with European species and rotation periods of 80 years and more. But he had to make allowance for substantial differences in the height of mean trees of equal average diameter by the introduction of his upper and lower tariffs.

The computation of volume with the help of the tariff is effected by the simple formula $V_{ha} = N_{ha} \cdot V\text{-}_{Dg}$ or expressed in words: the volume of timber of a stand per hectare (V_{ha}) is found as the product of the number of trees per hectare (N_{ha}) and the tariff volume of the basal area mean tree ($V\text{-}_{Dg}$).

This simple formula makes the measurement of heights unnecessary. It assumes that irrespective of age-or

[1] See also *Unasylva*, Volume 11, Number 4 "A forest inventory in Thailand" by the same author, who is Chief of the Forest Research Institute for Inventory and Management, Reinbek, Germany.

[2] Either the average height of the 100 largest girthed trees per hectare or the average height of dominants.

site-class, a certain average height and consequently a certain volume is strictly related to a given diameter of the basal area mean tree. This assumption, however, only applies to European species within a limit of variation of plus or minus 12 percent. For tropical fast-growing species such as *Pinus merkusii*, *Agathis loranthifolia*, *Acacia decurrens*, and *Antocephalus cadamba*, for which yield tables have so far been computed, it was found that the curves " diameter over height " only diverge a little with the age- and site-classes. The first evaluation resulting from the use of a yield table made it clear that a single tariff for the total volume of timber, without introducing variations of ± 12 percent, was sufficient.

Furthermore it was proved that the relation " diameter of the basal area mean tree " (D) to " volume " (V) clearly followed the exponential function $V = a \cdot D^b$, where a and b are constants. When transferred into logarithmic form, the equation could be expressed as $\log V = \log a + b \log D$.

This transformation simplifies the method of computing a tariff quite considerably. With the aid of the least squares method, the corresponding optimum straight line was found for each timber species on the double logarithmic paper through computation of the two coefficients of regression, log a and b. More details about the theoretical background of the mean tree tariffs are given in FAO/ETAP Report No. 1281, *Application of mean tree tariffs for the further development of forest management of the plantation forests* (*Indonesia*).

The computation of sound mean tree tariffs must be based on a considerable amount of research. Indonesia is in the favorable situation that for 20 to 30 years the Forest Research Institute at Bogor has had under observation hundreds of permanent sample plots. Thousands of felled trees have been measured and cubed in two-meter sections. Yield and volume tables for various species have been prepared.

From this material the writer was to compute mean tree tariffs for the most important species, the coefficients of regression for which are as follows:

Species	log a	log b
Pinus merkusii	— 4.65698	+ 2.94761
Agathis loranthifolia (West Java)	— 4.18010	+ 2.72423
Agathis loranthifolia (East Java)	— 3.93669	+ 2.47980
Acacia decurrens	— 3.49500	+ 2.21496
Albizzia falcata	— 3.65761	+ 2.41198
Antocephalus cadamba	— 4.31180	+ 2.83100

The tariff curves " volume over diameter of the basal area mean tree " are shown in Figure 1. The tariffs give solid wood under bark down to 7-centimeter minimum diameter without branches. For practical use

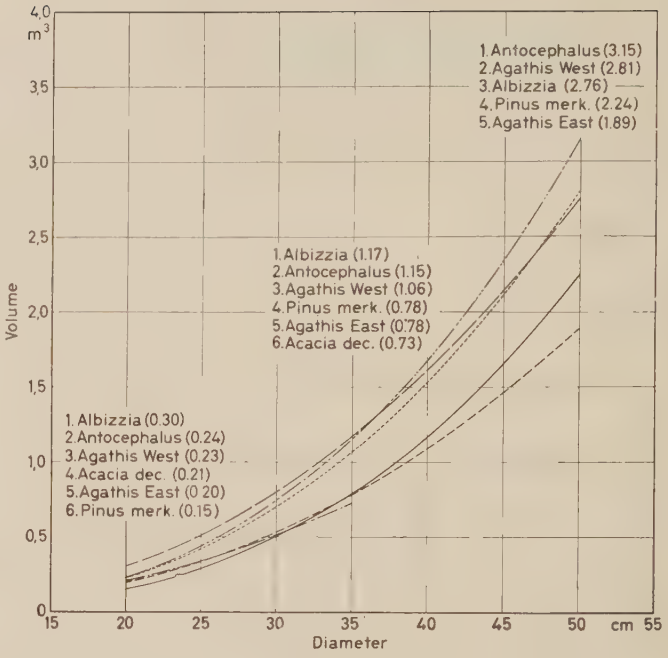


FIGURE 1. – *Mean tree tariffs of various fast-growing species of Indonesia.*

tariff tables have to be prepared which give the volume down to 3 decimal places for each millimeter of the diameter, as an example shows:

Pinus merkusii

D/V	0	1	2	3	4	5	6	7	8	9
31	0.548	0.543	0.559	0.564	0.569	0.575	0.580	0.586	0.591	0.597
32	0.602	0.608	0.613	0.619	0.626	0.630	0.636	0.642	0.648	0.653

Before a tariff can be handed over to a forest administration, a thorough check on its usefulness has to be made. The FAO report already cited dealt to a large extent with the results of such tests in Indonesia which satisfactorily confirmed the theoretical assumptions for *Pinus merkusii*, *Agathis loranthifolia* West and East and *Acacia decurrens*, whereas the tariffs for *Albizzia falcata* and *Antocephalus cadamba* are still of a preliminary character.

Implements for direct reading of basal area

The total volume of a unit area is computed by the mean tree method without dividing the trees into diameter classes. For most fast-growing species this total volume estimate is sufficient as the greatest part of the timber is destined for pulp and paper mills.

For finding the basal area mean tree of a stand it is more convenient to note down on the tally sheet the two-dimensional basal area instead of the one-dimensional diameter or circumference as is customary. One of the handiest implements for direct reading of basal area is the *Visiermesswinkel* designed by Bitterlich. This tool uses the so-called Wanner weights as a scale. The

Wanner weight class 1 means 1/40 square meter or 0.025 square meter, class 2 correspondingly 2/40 or 0.05 square meter, etc. Multiplying the basal area of a tree, as fractions of square meters, by factor 40, Wanner attains a grouping into classes of equal basal areas indicated by round figures 1, 2, 3, etc., each of a sphere of 0.025 square meter. (This means that the basal area scale is calibrated in units of 0.025 square meter so that class 1 corresponds to a basal area of 0.025 square meter, class 2 to a basal area of 0.05 square meter and so on.)

The principles of the Wanner weight's division into classes has proved its worth in regard to a range of diameters between 30 and 80 centimeters. For some tropical species like *Acacia decurrens* or mangroves the basal area mean tree usually lies between 15 and 30 centimeters d.b.h. It was necessary, therefore, to develop an additional implement for these species with smaller diameters. The *Kreisflächenstufenkluppe* designed by the writer (Figure 2 c) uses the multiplication factor of 160 instead of 40. The range of diameters from 6.3 to 30 centimeters d.b.h. is divided into 12 equal intervals of 0.00625 square meter. The mathematical background for the construction of this implement is given in FAO report No. 1281.

A practical advantage of this tool lies in the possibility of fastening the tally sheet to the side of the implement, thus saving a second man for recording.

Another easy way for direct reading of Wanner weight classes is to use a tape measuring with a Wanner weight scale (Figure 2 b). This tape is to be recommended especially for forests with trees of bigger diameters, because the reading with the *Visiermesswinkel* of diameters over 80 centimeters d.b.h. is inconvenient.

Field practices

In using the mean tree method in the case of a smaller stand to control felling losses or for fixing stumpage rates, it is advisable that all trees should be measured. But full enumeration is too costly and also unnecessary for the purpose of drawing up working plans. Careful sampling will suffice. As the result of his work in forests in Europe as well as in southeast Asia, the author has found again and again that the small circular sample plot of 0.05 to 0.01 hectare, spread as systematically as possible, gives the most certain results while costing the least.

It may be taken as a rule that errors of up to 15 percent may be tolerated in individual plantations but that an estimate within about ± 5 percent for the total of all stands due to be cut over during the next management period is necessary to enable forest officers to decide on the total annual cut.

The author carried out statistical calculations with respect to stands of *Pinus merkusii* as well as *Agathis loranthifolia* to discover the necessary number of sample plots for both of the cases mentioned above. The broad result of this investigation, the details of which are given in FAO Report No. 1281, are as follows.

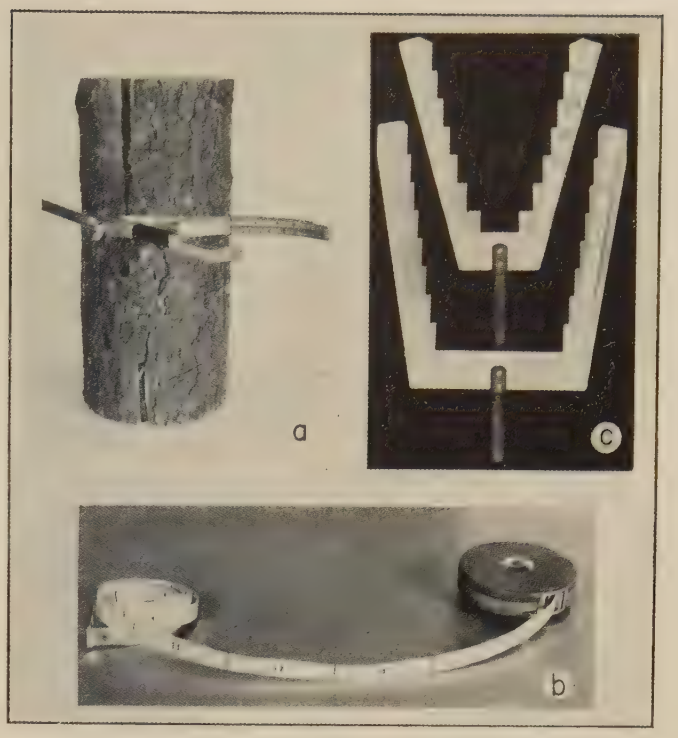


FIGURE 2: (a) " *Bitterlich Tarifmesswinkel* " *with Wanner weight classification.* (b) *Tape with Wanner weight classification.* (c) " *Kreisflächenstufenkluppe* " *for* Acacia decurrens *and* Mangrove, *using Quarter Wanner weight.*

Because of the larger number of stems per hectare, statistical conditions are more favorable for *Agathis loranthifolia* than for *Pinus merkusii.* With 50 sample plots of 0.02 hectare in *Agathis* stands, the $t \cdot S_v$ margin of ± 15 percent will generally not be exceeded, whereas in *Pinus merkusii* stands 100 sample plots are necessary to achieve the same accuracy. To obtain results for the total of mature stands of a forest district 500 sample plots are sufficient.

Assuming a minimum size of about 50 hectares for the individual assessment unit (= stand or group of even-aged stands), *Agathis loranthifolia* would be best served by one sample plot for every hectare (2 percent cruise) and *Pinus merkusii* by two sample plots per hectare (4 percent cruise).

In mountainous country the process of walking from one sample plot to the next takes up most of the working time. An absolutely systematic distribution of sample plots would require a lot of time to be spent in walking but would also ensure the best statistical efficiency. A compromise therefore seems necessary to meet practical and statistical requirements. Accordingly, the author has proposed for *Agathis loranthifolia* a completely systematic distribution of sample plots at a distance of 100 meters by 100 meters, while for *Pinus merkusii* the distance between two adjacent cruise lines should be 100 meters, with only 50 meters between two sample plots.

Serviceable forest maps to the scale 1:10,000 are available for most parts of Indonesia. To ensure random distribution of the sample plots, the basic line is decided by chance and not by deliberate choice (e.g., a ruler

is dropped on the map). The entire system of the projected sample plots is drawn along this base line on a sheet of the forest map. The sample plots must be numbered afresh for every assessment unit.

An inventory crew consists of a team leader (he can be a forest guard but must be able to handle a compass and to make reliable entries on a printed form), one man working with *Visiermesswinkel* and tape for ascertaining the radius of the plot at the same time, and, according to the terrain, one or two men to clear a path or help generally. The team leader, by means of the forest map prepared with the linear sampling system, first looks for the points of entry of the lines into the forest. There are frequently boundary stones, or measured paths and roads. The bearing has been laid down previously. The inventory then proceeds by routine, the centers of the circular sample plots being found with the help of a compass and a tape for measuring distances.

The avoidance of any subjective choice is more important than extreme accuracy in the location of plot centers. In Indonesia a general principle is that the area of deeply cut river valleys (mostly stocked with bamboo) are not recorded if they are smaller than 4 hectares. If such areas occur in a plantation, the team leader should ascertain the number of sample plots falling in these valleys and declare them as zero plots. If he fails to do this, errors will result and the volume figure will be much too high.

After the center for a circular sample plot has been determined, the next step is to count the trees within the plot and to determine their basal areas using the Wanner weights. (Tally sheet follows.)

No time-consuming height measurements have to be made. The plot (radius: 7.98 meters) is measured by tape only in really doubtful cases; these generally occur at a distance of between 6.5 and 9.5 meters from the center of the circular area. Experienced teams usually only need to take one radius measurement within a plot circle. If a tree stands exactly on the plot boundary it is included in the sample plot if the accurate distance from the center of the circular sample plot to the heart of the tree is 7.98 meters or less. It is important on slopes that the tape should be held horizontally. Borderline cases necessitating a radius measurement correct to the nearest centimeter are rare. Experience has shown that the performance per team for the system of distribution "one sample plot per hectare" is 20 to 25 circular sample areas per day, and 30 circular sample plots per day in the case of the "two sample plots per hectare" system.

Where two or three teams are operating, they should work under a university-trained forester. His duty is the entire planning of sample plots, drawing of maps, controlling of the work (daily visits to the teams in the forest) and descriptions of the stands. In the case of *Pinus* and *Agathis*, only those stands more than 15 years old need to be inventoried, younger ones merely requiring a few supplementary measurements in addition to visual assessment. The method leads to statistically sound results for estimating the volume of the growing stock, and this can be accomplished in a very short time if organization is good.

The arithmetical evaluation is very simple: as the example attached shows, for each assessment unit the mean Wanner weight $\overline{w}$ is found by adding the measured Wanner weight figures and dividing the sum by the number of measured trees

$$\overline{w} = \frac{\Sigma w}{\Sigma N}$$

TALLY SHEET

Date 27.8.1958

Forest district: *Lembang*
Compartment: *25A*
Species: *Pinus merkusii*

Size of circle sample plot: *0.02 ha.*
Crew leader: *N.N.*
Checker: *N.N.*

w / n	1	2	3	4	5	6	7	8	9	10	11	12	ΣN	
1	/	//	/	///	/	/							9	
2		//		///		/							6	
3	/		///	/	/								6	
4	/	/	////	/	/	/							9	
5	/	/	~~////~~	/	/		/						10	
ΣN_w	4	6	13	9	4	3	1						40	ΣN
wi ΣN_w	4	12	39	36	20	18	7						136	Σw

$$\overline{w} = \frac{\Sigma w}{\Sigma N} = \frac{136}{40} = 3.4; \qquad \overline{N}/ha = \frac{\Sigma N}{0.02 \cdot n} \qquad \frac{40}{0.02 \cdot 5} = 400$$

The number of stems per hectare (N/ha.) is obtained by help of the simple formula

$$\frac{\Sigma N}{0.02\ \Sigma n}$$

if 0.02 is the size of the sample plot.

As already mentioned the calculation of the volume per hectare which it is desired to know, follows the formula

$$V_h = N_{ha} \cdot V_{\overline{D}_g}.$$

To enter the tariff it is therefore necessary to tranfer the $\overline{n}$ into D_g.

A conversion table has been constructed for this purpose:

$\overline{D}_g$ \ w	0	1	2	3	4	5	6	7	8	9
31	3.02	3.04	3.06	3.08	3.10	3.12	3.14	3.16	3.18	3.20
32	3.22	3.24	3.26	3.28	3.30	3.32	3.34	3.36	3.38	3.40

The entry 3.04 means that for a diameter of 31.1 centimeters the Wanner weight is 3.04 (or rather that a Wanner weight of 3.04 corresponds to a diameter of 31.1 centimeters). From the example given on the tally sheet, $\overline{w} = 3.40$ the diameter of the basal area mean tree reads 32.9 centimeters. With this diameter the volume $^{v}\overline{D}_g$ reads 0.653 cubic meter. Hence:

$$V_{ha.} = 400 \times 0.653 = 262\ ^{m^3}/_{ha.}$$

An inventory with only five plots — given as example — has of course no practical value. To illustrate the growing stock of *Pinus merkusii* in Java some results of stands assessed are given in the following table (size of sample plot = 0.02 hectare):

	No.	Locality	Age	N/ha	$\overline{D}_g$	$V_{\overline{D}_g}$	V/ha = $N \cdot V_{\overline{D}_g}$
Lembang	1	30e	10	584	23.4	0.239	139.6
	2	30a	17	268	33.4	0.683	183.0
	3	30b	18	229	33.4	0.683	156.4
	4	30c	21	196	36.7	0.902	176.8
	5	30d	22	150	37.3	0.946	141.9
		2–5 Total	17/22	206	35.3	0.804	165.6
Tjiremai	6	IX	19	372	28.3	0.419	155.8
	7	VIII	20	244	32.3	0.619	166.1
	8	VII	21	218	33.7	0.701	152.8
	9	V, VI	22	243	36.3	0.873	212.1
	10	I/VI	23	233	34.3	0.739	173.2
	11	XVI, XVIII, XX	?	266	34.1	0.726	193.1
		6–11 Total	19–23	281	31.9	0.597	167.7

Mean tree tariffs for bark weights of Acacia decurrens

Acacia decurrens is managed with a rotation of 6 to 8 years in order to extract tannin from its bark. The debarked wood is sold as fuelwood and can only be regarded as a by-product. The author has attempted to amalgamate the existing correlation between the yield of bark per tree and d.b.h. into a tariff for the bark according to the mean tree method. A tariff was also computed for the fuelwood yield.[3]

From the three site classes of the yield table the values " mid-diameter over mean weight of bark (wet) for a tree " were extracted. The result on double logarithmic paper was that within the range of diameters from 14 to 35 centimeters the values were very well covered by a straight line. The computed equation was:

$$\log\ y = 1.8409 + 2.6591 \log x \text{ where}$$

$$y = \text{weight of bark per tree}$$

$$x = \text{diameter of the mean tree}$$

From this equation the tariff was calculated, an example of which is given as follows:

ACACIA DECURRENS
WEIGHT OF GREEN BARK PER TREE IN KILOGRAMS

D in cm	0	1	2	3	4	5	6	7	8	9
17										
18	31.4	31.9	32.4	32.8	33.3	33.8	34.3	34.8	35.3	35.8
19										

This tariff was carefully checked and it proved suitable for wattle from west Java only, whereas for wattle from east Java the wet weight of bark found by tariff must be reduced by 20 percent. The reason for this discrepancy is that the bark of east Java wattle is thinner. Whether this is due to climate and soil factors or to various subspecies could not be exactly ascertained. The yield tables are based mostly on the older experimental plots of west Java. This study on Indonesian wattle shows that tariffs for bark weight are valid only for limited regions.

The practical value of the mean tree tariff lies in the possibility which it gives for selling on the stump and thus avoiding the weighing of the removed bark with all its drawbacks (time-consuming and losses due to drying if the weighing cannot be done immediately after peeling).

An instrument for ascertaining the basal area mean tree, *Kreisflächenstufenkluppe*, was constructed (Figure 2 c). The transforming of the quarter Wanner weight

[3] W. v. Wülffing's yield table (*Medelingen van het Boshouwproefstation*, No. 28, 1945) could be drawn upon as a source of information. Hellinga's table (1939 *Tectona*, Part XXXII) was consulted for comparison. Hellinga delivered a lecture at Bogor on 3 May 1952, *Boshouw en Voedselproductie*, in which he discussed in detail the subject of *Acacia decurrens*; use has been made of this lecture by the author of this article.

into diameter needs a conversion table different from that for the regular Wanner weight. Detailed information is given in FAO/ETAP Report No. 1281.

Tariff for bamboo inventory

The yield of bamboo is expressed as weight. The planology brigade of east Java (Malang) in 1955 investigated the measured weights for the most important species, *Gigantochloa apus*, on a sample strip 20 meters broad with a total area of 13.5 hectares. For every culm weighed, the d.b.h. in centimeters was also recorded.

The author has carried out examinations in the light of this information. Classified according to the three local names for bamboo, *Apus*, *Batu* and *Ulet*, diameter groups of 0.5 centimeter were formed, beginning with 3.5 centimeters and ending with 11 centimeters d.b.h. For each group the mean diameter in millimeters and the mean weight of the diameter group in 0.2 kilogram were computed.

These values, inscribed on normal millimeter paper, resulted in parabolic curves. Instead of the diameter, the corresponding value for the basal area ($r^2 \pi$) was now used in the abscissa. The resulting dots clearly followed a straight line, and significant differences between the local subspecies could not be discovered. With the aid of the method of the least squares, the best fitting straight line was computed for the prepared material. The following relation resulted:

$$y = 1.71297 + 5001.71428 \times x \text{ where}$$

y = the weight in kilograms

x = the basal area in square meters.

The tariff for the mean weights was computed for Indonesian *Gigantochloa* according to this formula, using the d.b.h. as initial value.

Because of the high number of culms per hectare (between 2,000 and 7,000) and their growing in dense clumps of various sizes (between 5 and 300 culms) a special design of subsampling had to be selected, a detailed description of which would exceed the scope of this paper and readers are referred to the FAO report already mentioned.

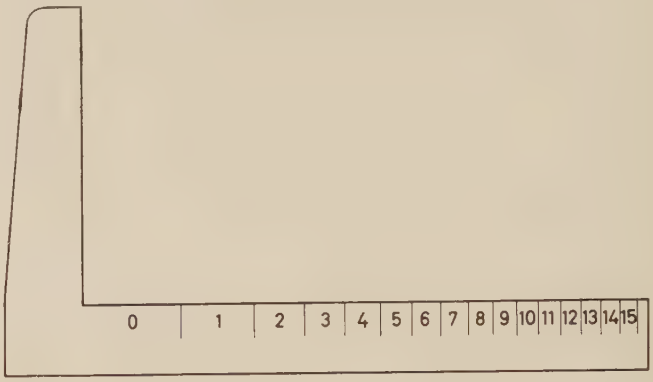


FIGURE 3. – *Tool for measuring diameters of bamboo culms using* 1/20 *Wanner weights as classification.*

But it should be pointed out that the author recommended a special and simple implement for direct reading of basal area of the culms based upon 1/20 Wanner weight (see Figure 3).

Conclusion

Developing countries in the tropics need simple but statistically sound methods for forest inventories. For forest plantations with short rotation the mean tree tariff method seems to be promising. For species with a long rotation period (i.e., teak) this method can also be used and even extended to include an assessment of timber quality classes as well as of total volume.

The results achieved in Indonesia appear to be sufficiently significant to justify a broader discussion upon the method itself; because the author believes that with suitable modifications it could also be helpful for other tropical countries.

New Designs for Fuelwood Cooking Stoves

H. Singer
Swiss Forestry Association, Solothurn, Switzerland

The author undertook a mission in Indonesia, under the sponsorship of FAO and the Swiss Government, to investigate the improvement of fuelwood cooking stoves and secure economy in fuelwood consumption.

Fuelwood production and forestry economy

Wood surpasses any other natural substance in the diversity of the uses to which it can be put: it can be used as a building material or as a substance to be worked, as a raw material in the chemical industry, and as a combustible.

Even when trees in their yearly growth supply wood quite naturally and abundantly, it is still essential that it should be utilized as intelligently as possible. Any overconsumption can involve disastrous consequences, which must be forestalled.

Wood is man's oldest source of heat, since it is more accessible than any other fuel and also simple to ignite. It is this very accessibility which accounts for its still being burnt in primitive fireplaces according to traditional procedures. The result can only lead to very high consumption, amounting to serious wastage.

The situation indeed differs from country to country. In one the full possibilities of wood as a source of energy have not yet been realized; in another, on the contrary, consumption must be cut down so as not to overwork the forests. Elsewhere wood is faced with competition from other fuels. But everywhere, the problem to be solved is the same: how to use the heating potentialities of wood to better advantage.

Economizing in fuelwood

Solid natural fuels, although all of the same origin, can nevertheless be clearly differentiated one from another by their external appearance and by their basic constituents and composition. These characteristics account for their different burning properties. If, therefore, one wants to take most advantage of the heat produced, the peculiarities of the various fuels

Figure 1. – *Construction of the FAO/Singer stove.*

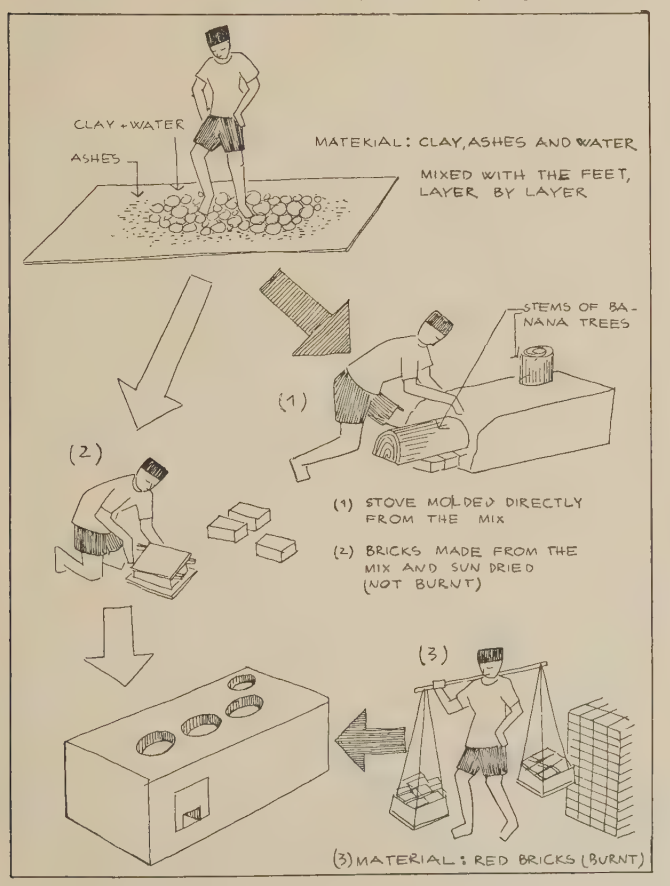
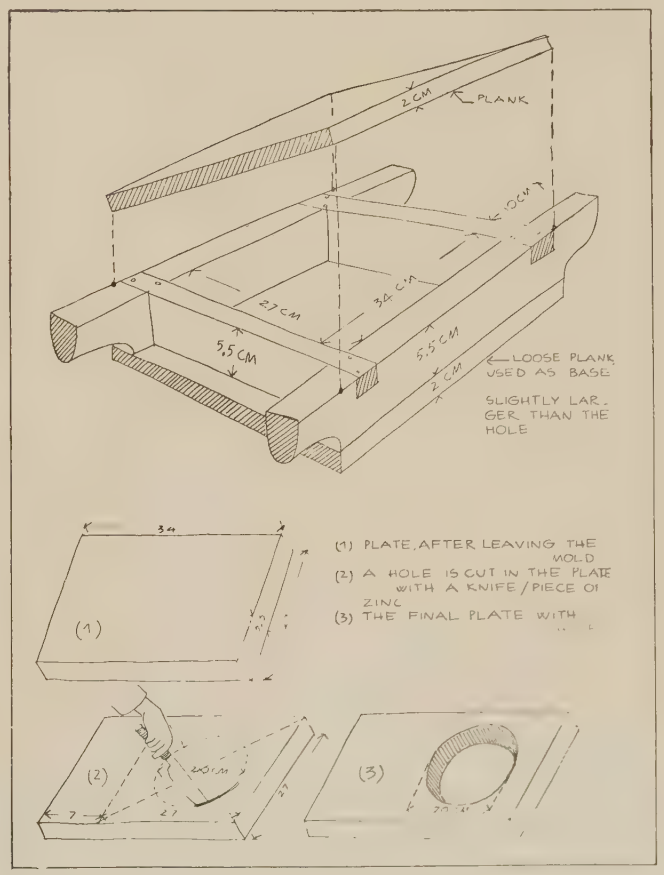


Figure 2. – *Plate mold: (1), (2), (3) plates.*



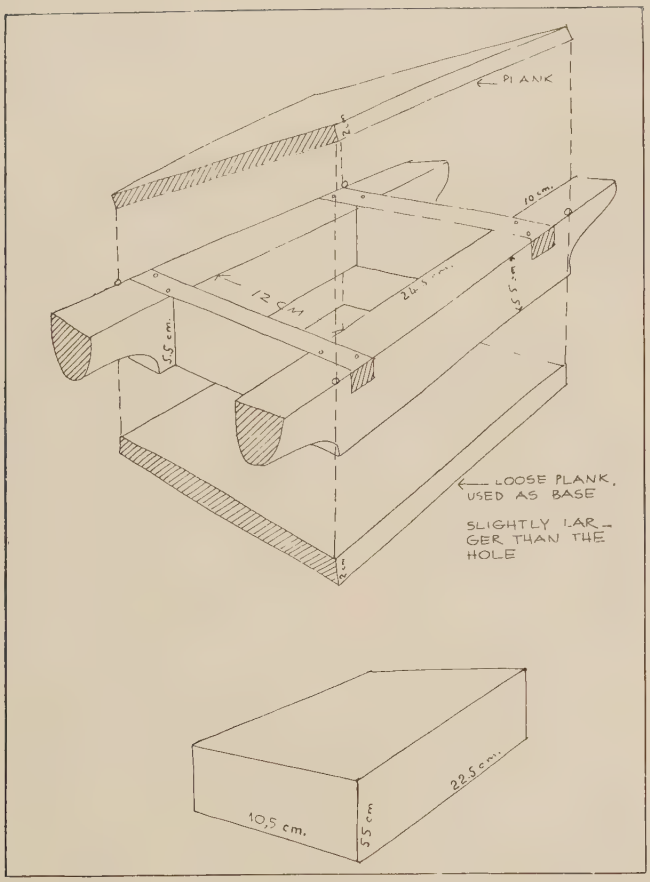


FIGURE 3. – *Brick mold with, below, diagram of a sun dried (not burnt) brick 5 × 10.5 × 22.5 centimeters.*

and their different burning properties must be taken into account. In several countries some fundamental research work, accompanied by practical experiments, has been carried out. General conclusions have then been drawn for the manufacture and operation of fuelwood fires. The final result has been cooking stoves and heating devices which, while intelligently employing the principles of combustion, are also clean and easily operated.

Wood burns easily and requires no special prior preparation as a fuel. This is exemplified by the more or less typical cases of the stoves in use so far in Indonesia. But tests have proved that these stoves are not efficient users of fuelwood. Certainly the calorific power of wood can be much better utilized.

Because of its high content of volatile constituents, wood burns comparatively quickly, with a long flame, and requires very little oxygen to burn. These properties must be borne in mind in the construction of the hearths, if good results are to be achieved.

This has been done in the construction of the new stoves, which have the following characteristics:

1. a closed hearth with a limited intake of air for the combustion process;
2. flues for the flames and fumes;
3. a chimney.

The hearth

The hearth has these functions to fulfill: to hold the necessary amount of wood, to give the flame enough room to grow, to hold the live embers together in a tight mass, and to ensure concentrated burning. It is impossible to give exact dimensions which are generally applicable. In the models considered here, the hearth is 27 to 28 centimeters long, 16 to 18 centimeters wide at the bottom and 18 to 20 centimeters at the top. The internal height ought to be 20 centimeters. Above all it is essential that the hearth should be completely closed in. The stokehole is stopped with a stone, in the bottom of which there should be an opening of 6 × 4 centimeters to act as an air-intake.

The flues for the flames and the fumes

When a stove has several cooking holes, the heat must be directed to them, otherwise there is excessive wastage. This function is performed by a flue. This flue must be so designed that it concentrates the flames and fumes at the cooking holes before they are carried out of the stove. The fumes are directed by the flue so that they are most intense at these places; in this way, an effective use of the heat is ensured.

FIGURE 4. – *Chimney of FAO/Singer stove. Note that the chimney must be independent of the roof construction; materials for the chimney are drainage pipe and bricks; total area of ventilation openings must be larger than that of the chimney hole; and the length of the chimney, from stove surface upward, should be a minimum of 2.5 meters.*

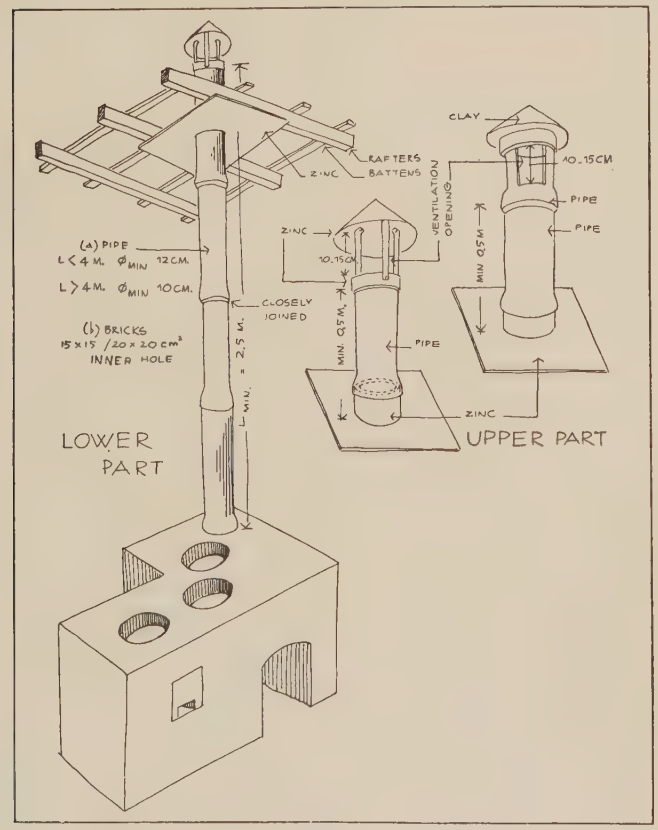
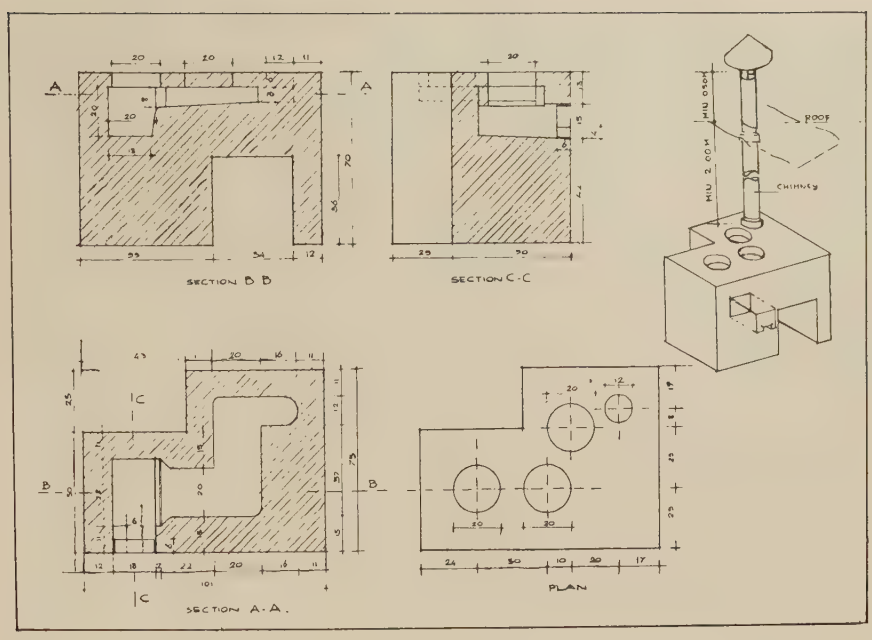


FIGURE 5. – *Modified FAO stove. Higher type. 633/T. Scale 1 : 10. All dimensions for figures 5-15 inclusive are in centimeters, unless otherwise stated.*



The chimney

The chimney must serve several purposes. To some extent it constitutes the motive power of the combustion process. Its most obvious function is to lead off the fumes to the outside air; but it must also set up the draught which causes the intake of air needed for combustion. Only a good chimney can ensure efficient and economic functioning. The draught is caused by the difference in temperature between the outside air and the fumes, which in turn gives rise to a difference in weight. However, as this motive power is weak, certain factors have to be taken into consideration in the construction of chimneys. The size of the cross section will depend on the size of the hearth and the height of the chimney. For kitchen stoves with chimneys up to 4 meters in height it is preferable to use a pipe of hard baked clay with a 12-centimeter hole. For even higher chimneys a 10-centimeter hole is sufficient. The minimum height must be 2.5 meters.

As the chimney must be airtight, it should be assembled with care, the joints being mortared.

A cover, set in such a way that the outcoming smoke is not hindered, must be provided to prevent rain from penetrating into the chimney. The chimney should also be cleaned every six months. The simplest procedure is to do this from the top end; a suitably sized brush is fixed on the end of a bamboo stick and then pushed up and down in the chimney several times.

Dry wood should be used in stoves not only because it is more economical, but also because it is safer. When green wood is burnt, a tarry deposit forms on the inside of the chimney. This may catch alight in the stove when a strong fire is burning. To put out a fire in the chimney, one must immediately prevent the air from entering it. Any chimney bearing signs of tarring up should be replaced before it catches fire.

The chimney can also be built of brick, the joints still being made airtight. The cross section can measure 15 × 15 centimeters or 20 × 20 centimeters. A chimney of this type is undoubtedly more costly than a clay one; on the other hand, it lasts longer, is safer, and therefore more satisfactory.

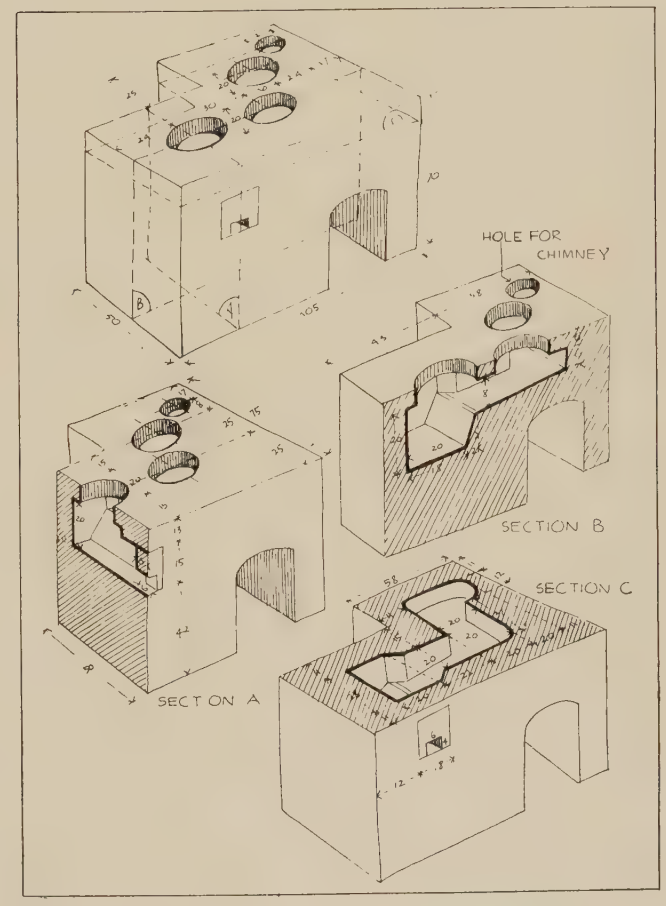


FIGURE 6. – *FAO/Singer stove 1. Higher type. 633/T.*

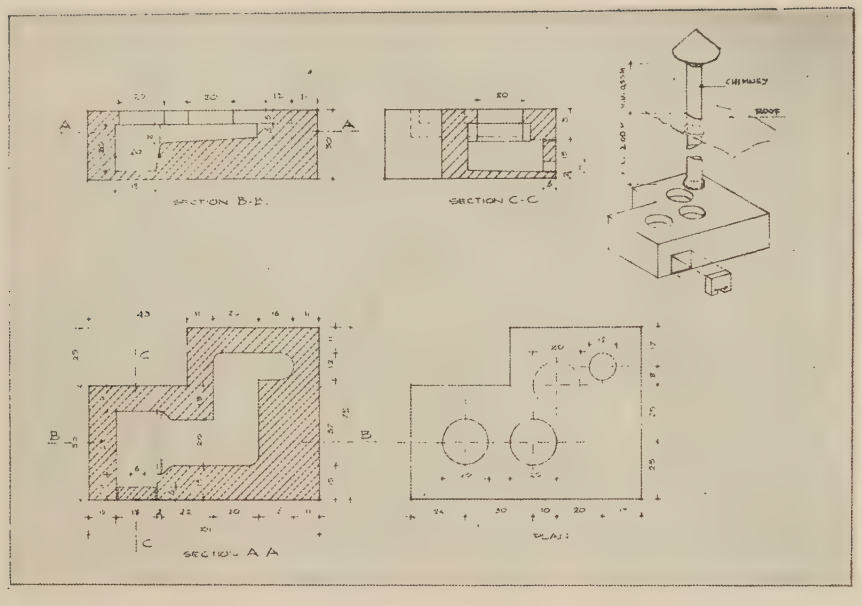


FIGURE 7. – *Modified FAO stove. Type I. 634/T. Scale 1 : 10.*

MATERIALS AND CONSTRUCTION OF THE NEW STOVES

The traditional type of stove lasts barely a year. It is for this reason that special attention has been given to the materials and a number of tests have been carried out to ensure that the new models have a longer life. As the basic material, fired clay, dried or moist, was chosen. Sawdust, rice husks, rice straw or ashes can be mixed in to impart greater strength to the clay. Three ways of construction were selected: with burnt bricks, sun-dried bricks or clay.

Stoves of burnt brick proved to be the best and most durable. The bricks are 22 centimeters long, 10 centimeters wide, and 5 centimeters high. They are made 50 percent of clay and 50 percent of sawdust, the whole being thoroughly mixed, then placed in wood molds of the correct size and finally oven-baked. The resulting bricks are easy to work with and fire-resistant. When laying them, it is essential that they should be moistened to make sure that the mortar takes. For mortar, a mix one part cement to four parts sand (ground from the bricks) is used. Clay, even when other materials are mixed in with it, is not suitable as mortar, because it contracts too much from the heat, thus causing the joints to crack and the bricks to become loose.

The most difficult part to make, however, is the plate with its three cooking holes and one chimney hole. The simplest solution is to make three plates for each oven. They have the same composition as the bricks and are formed in a mold. Before they are fired, they should be allowed to dry out somewhat until they are solid enough for the cooking hole to be cut. Figure 2 shows the mold and gives the measurements of one of these plates. The plate can also be in brick, though this is a little more difficult to make. The bricks must be well laid and mortared. A round wooden forming-block (20 centimeters in diameter) should be used to make sure that the holes are perfectly shaped. Quite apart from their durability, stoves made of brick have the added advantage that only three or four days must be allowed for drying out, before they can be used.

The second method is to employ only sun-dried bricks. These bricks, although made in exactly the same way, are allowed to dry in the sun. The stove is assembled as in the first method. The mortar, however, is clay mixed with 40 percent sawdust and 10 percent ashes. The mold and dimensions of the bricks will be found in Figure 3. It is recommended that the mold should be sprinkled with dry ashes before the mix is tipped in.

FIGURE 8. – *FAO/Singer stove I. Lower type. 634/T.*

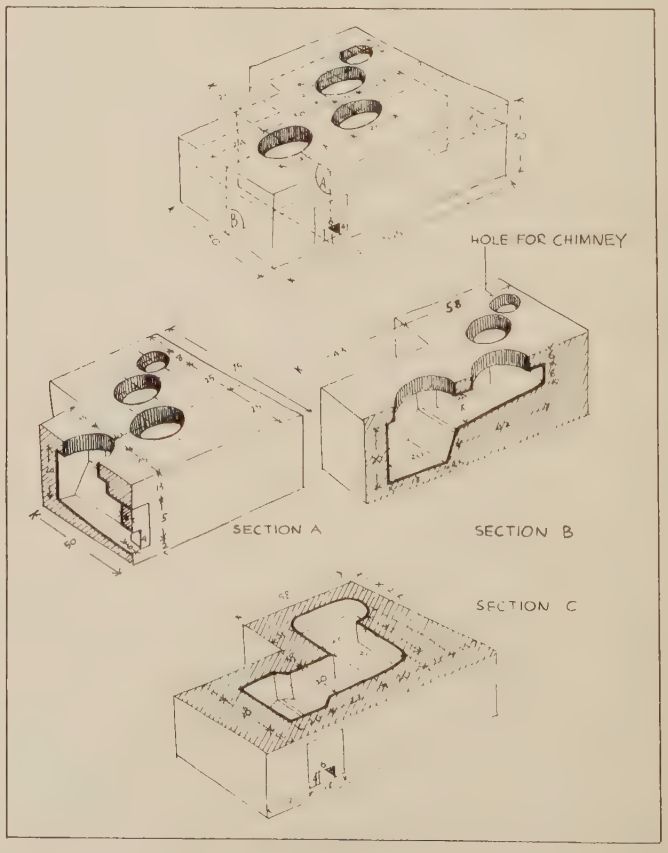
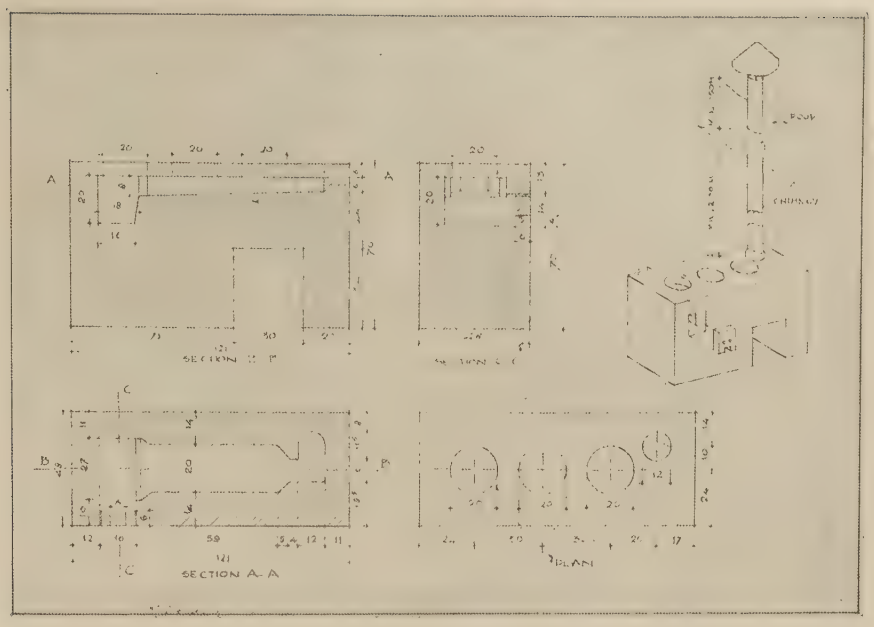


FIGURE 9. – *Modified FAO stove. Type II. 635/T. Scale 1 : 10.*



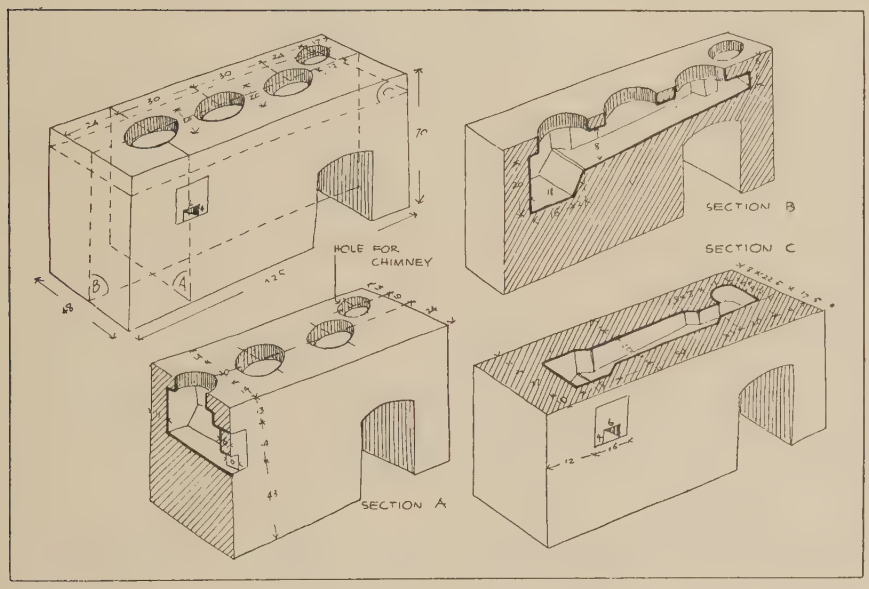


FIGURE 10. – *FAO/Singer stove II. Higher type. 635/T.*

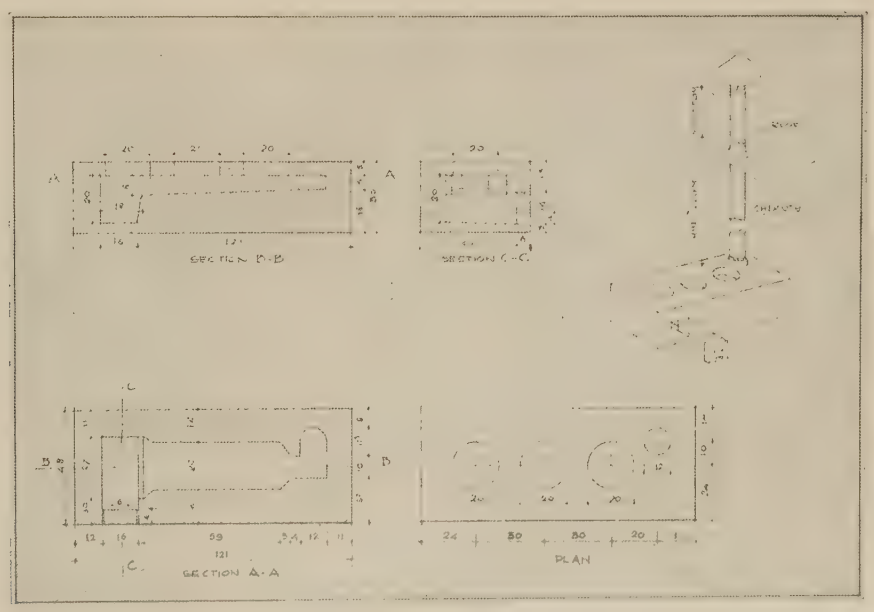


FIGURE 11. – *Modified FAO stove. Type II. 636/T. Scale 1 : 10.*

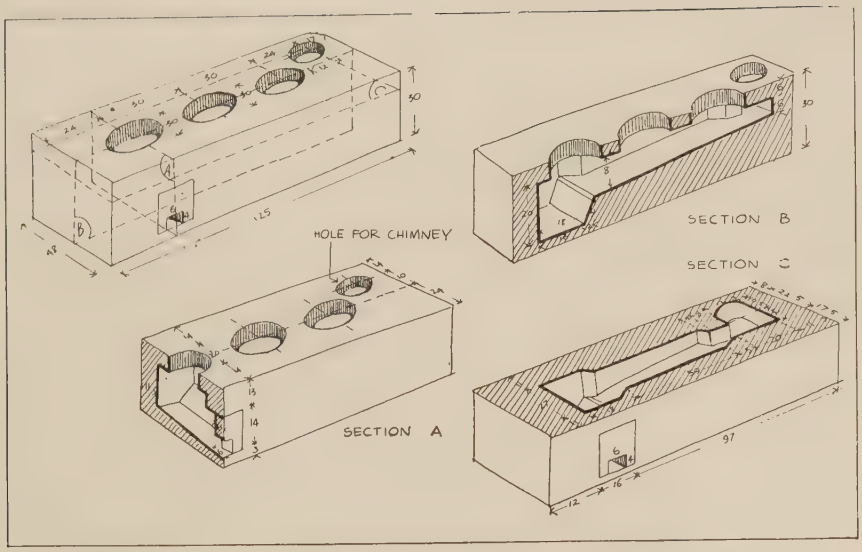


FIGURE 12. – *FAO/Singer stove II. Lower type. 636/T.*

The advantage of such a method is that more often than not the materials will not have to be bought. On the other hand, the stove will not last as long as one built with burnt brick. Furthermore, because drying out takes longer, more time must be allowed to elapse before the stove can be used.

A very simple method, which employs clay, is the third. It is, however, also the most unsatisfactory in its operation and the shortest lived. Moreover, it is a method which can be employed only for low stoves. Therefore it should only be used in the absence of burnt or sun-dried bricks. The basic material used is clay, to which rice straw and ashes have been added. A mix of clay and sawdust should on no account be used, for these materials contract differently in drying out, so that cracks would appear. Not more than 15 percent of water should be added to ensure that the clay is malleable enough for the mold.

First one constructs a base which will have the same ground area as the floor of the stove. To make the hearth space and the flue holes, forming-blocks should be used, such as the stems of banana trees (Figure 1). The blocks should not be removed until the clay is sufficiently dry. The inside of the stove is then shaped in the form shown in the diagram.

Whatever method is chosen, the chimney must be made from fire clay or burnt bricks. In Figure 4 the construction and layout of the chimney together with the way of passing it through the roof are all illustrated.

FUNCTIONING OF THE STOVES

Among the new models are included two with three holes and one with two holes; an improved model with one hole was also constructed. How they function and their exact measurements are shown in Figures 5-15.

Models 1 and 2 are fundamentally similar to stoves already designed in Switzerland. All that had to be done was to change the dimensions so as to adapt them completely to local conditions. These two models have a good hearth, closed at the front by a flat stone with a hole in it to act as an air-intake, and at the top by the

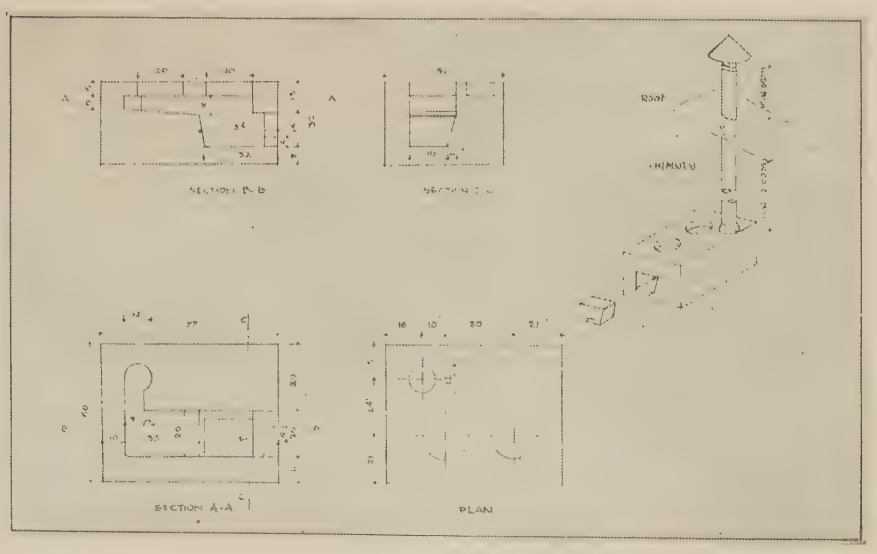


FIGURE 13. – *Modified FAO stove. Type R.H.C. 639/T. Scale 1 : 10.*

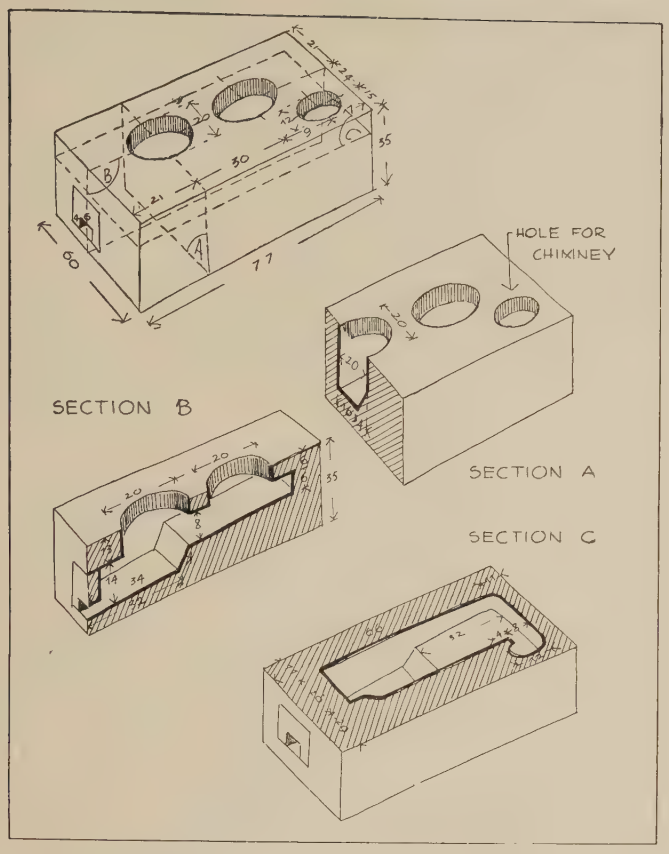


FIGURE 14. – *FAO/Singer stove III.*

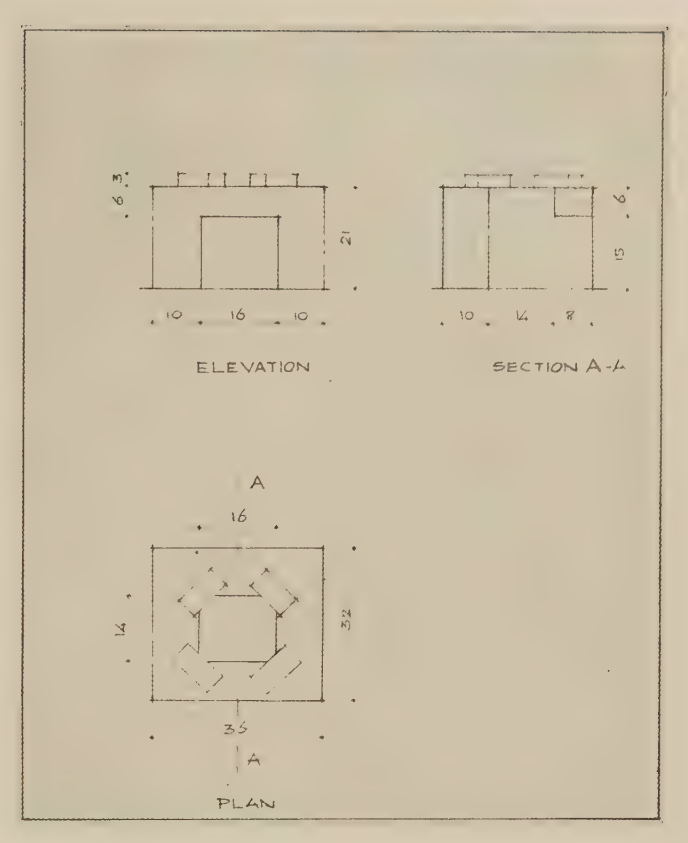


FIGURE 15. – *FAO one-hole type stove.*

cooking pots. The flue for the flames and fumes forms a continuation of the hearth. The flue narrows where it connects with the chimney. In the first model it is bent, and in the second it is straight; this is the only difference. Both models may be made high (ideal height 70 centimeters) or low (height 30 centimeters). Because of its construction and cost, model 2 is the most advantageous.

After examining the existing models and the culinary habits of the people, it seemed desirable to design yet a third model with two holes, for the benefit of small families. Its characteristics are the same as those of the other two models: a closed hearth, a flue and a chimney. The hearth is built in line with the cooking holes; but it can also be placed at right angles to them as in the other two models. As for the stoves with one hole (formed quite simply of three stones), they cannot be basically changed. One must be content with improving what is already there. In principle their construction is the same, but bricks are used. The front is closed in above the stokehole, which means that the heat is well concentrated on the pot. The model is illustrated in Figure 15.

TESTING THE STOVES

The tests were intended to determine the cooking efficiency and the technical output coefficient as well as the burning properties of certain woods.

They were carried out in various ways; but an effort was made to run parallel series of tests so as to be able to compare the results obtained from the different stoves. All three models were tested as well as a one-hole model. For the sake of comparison several one-hole models, burning wood and sawdust, and already on the market, were bought and tested. The models in question were of fire clay. The results were fairly satisfactory, but the material used in their manufacture failed to meet requirements; these tests were therefore abandoned.

Several kinds of wood were tested. The wood consumed was weighed exactly, and for each test 2 kilos of logs and 100 grams of kindling wood were used. Test samples of each kind were taken and the calorific power measured in the laboratory.

In every case the tests began with a cold stove. To determine the proportion of the heat available for cooking, a pot, 20 centimeters in diameter and containing 2 liters of water, was placed over each hole and the amount of heat absorbed was measured. The results obtained were as follows:

Model	*Percent*
1	23.4 to 28.2
2	26.6 to 28.7
3	20.5 to 23.5
One-hole	10 to 13

To find out how each stove burned, a sample of gas was taken at the outlet every five minutes. The carbonic acid, carbon monoxide and hydrogen content was measured by means of the Orsat apparatus. On

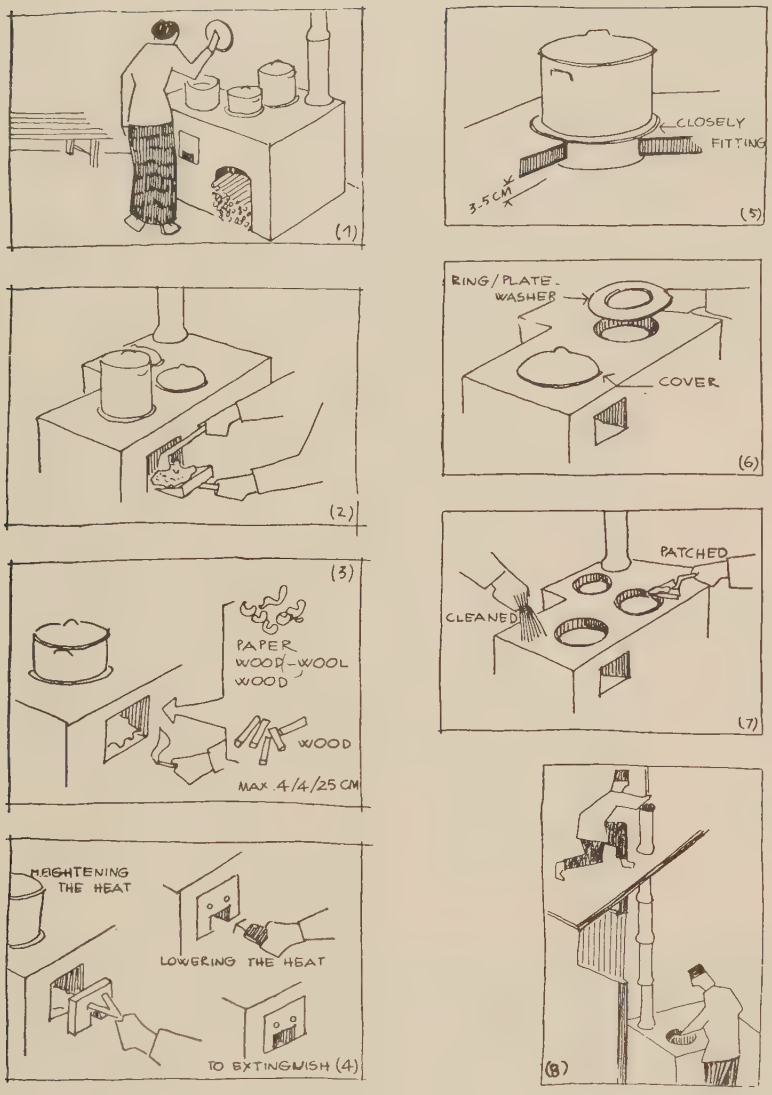


FIGURE 16. – *Use and maintenance of the FAO/Singer stove.*

(1) *It is economical on fuelwood, shortens cooking time, reduces the risk of fire, and keeps kitchen free from smoke.*

(2) *To clean, first close all openings and remove ashes from the stove.*

(3) *To lay the fire, first make a base of wood wool or paper with small pieces of wood, putting larger wood, chopped to size, on top.*

(4) *To increase the heat, close the fire-hole with its door; to lower the heat, half close the hole in the door; to extinguish the fire, close the door completely.*

(5) *The pan should fit the stove pit closely.*
The base of the cooking utensil should be 3 to 5 centimeters below the surface of the pit.

(6) *Regulating the stove pit.*
An unused pit should always be covered.
For pans smaller than the pit, rings/plate-washers can be used.

(7) *The stove should be cleaned regularly and all damaged places patched immediately.*

(8) *Maintenance of the chimney.*
Remove the chimney cap, sweep it clean, remove all the soot.
The chimney should be cleaned at least once every six months.

WARNING. *The use of wet or damp wood causes damage to the chimney (accumulation of pitch, leading to risk of fire).*
— *Pitch-contaminated chimneys should be replaced by new ones.*
— *In case of fire, the smoke passage leading to the chimney should be blocked.*

each occasion and simultaneously, a measurement was made of the heat of the fumes and of the amount of draught in the chimney. The technical output is given in the following list:

Model	*Percent*
1	81.1 to 83.1
2	77 to 80.9
3	72.3 to 77.2

As well as these full-scale tests, simple output tests were made with each stove to discover its cooking efficiency (the data are contained in FAO/ETAP Report No. 1315). From the results obtained, models 1 and 2 may be said to be more or less equal. But model 2 offers certain advantages: a more regular distribution of the heat over the three cooking holes; shorter cooking time; simpler construction and lower price — as has already been remarked. For these reasons model 2 is recommended as the best.

The results from model 3 were, inevitably, not so good. Nonetheless, for small families this model represents a great improvement on those at present in use.

In short it can be said that there are now stoves available which, as well as being easy to make, use the fuel to the best advantage. In addition, the risk of fire has been considerably reduced; the smoke fumes no longer cause annoyance and cooking is noticeably more hygienic.

COOKING TESTS

In addition to the trials which were described above, practical cooking tests were also made. Women from the home economics school at Bandung volunteered to help with the tests under the guidance of the Pasar Minggu Home Economics Institute, to ensure that the food would be prepared and cooked exactly in the Javanese manner. Both the traditional type of cooking pot and modern pots were used. Tests were carried out, using the following four types of stoves:

Traditional stove (3 holes) and pots
Model 2 (high) with modern pots
Model 2 (low) with traditional pots
Model 3 (high) with modern pots

Model 2 (high) New type pots		Model 2 (low) Old type pots		Model 3 (high) New type pots		Traditional Model Old type pots	
Cooking time min.	Wood kg.	Cooking time min.	Wood kg.	Cooking time min.	Wood kg.	Cooking time min.	Wood kg.
87	2.84	117	3.65	108	3.5	137	10
79	2.35	109	3.72	100	3.5	90	5.53
75	2.21	90	3.45	80	3.0	93	5.64

The same food was prepared on all stoves. This represents the normal menu of an Indonesian family of six:

Breakfast

rice
baked beans
tomato sauce
tea

Midday and evening meals

rice
baked beans and salt fish
vegetable soup
vegetables in sauce
bananas
tea

Altogether, 2,500 grams of rice, 1,680 grams of vegetables, 140 grams of small fish, 140 grams of oil and 12 bananas, costing in all 34 rupees, were used. Above are the cooking times and quantities of wood used for each stove.

These practical tests therefore demonstrate that there is a worth-while saving in both time and wood with the new stoves. It is important that pots which go down 3 or 5 centimeters into the stove should be used. The use and maintenance of the stoves is illustrated in Figures 16 and 17.

The Director-General of FAO, Dr. B. R. Sen, was received in a personal audience by Pope John XXIII on 28 July 1961. Dr. Sen expressed thanks for a reference to the good work of FAO made in the Pope's Encyclical "Mater et Magistra." Also pictured is (right) Msgr. Ligutti, Observer of the Holy See to FAO.

Courtesy, Pontificia Fotografia Felici, Roma

What Should a Basic Forest Law Contain?

T. François
Chief, Forest Policy Branch, Forestry and Forest Products Division, FAO

This paper has been prepared for field officers serving under technical assistance programs

The promulgation of laws is only the second step in the development of the national forest domain. The government of the country must first know what it wishes to achieve, that is to say, it must have a forest policy. The laws will naturally differ depending on whether the main goal is to open up virgin forests, to conserve existing forests, to restock stands with a view to soil conservation or for commercial logging, to develop community forests or to protect stands against fire, grazing, etc. Laws will also differ radically depending on the importance attached to privately-owned stands and on whether small or large forest owners are involved, and also on the policy toward such stands, that is, whether there will be strict control of fellings or whether the owners will merely be encouraged to manage their stands scientifically. Until such time as the major lines of such policies have been laid down, no legislation can be established.

Naturally, in order to frame such a forest policy, a country must know its forest resources, its present and future timber requirements, what reforestation is needed for soil conservation purposes and to protect agriculture, the obstacles in the way of forest conservation, etc. It is not always necessary to have on these points detailed information involving an inventory of available timber resources and ground surveys on land that either is, or should be, under forest, etc. Such an inventory is essential later for drawing up forest development plans and programs, the prerequisites for which are a sound policy and effective legislation.

Forest laws must be in harmony with the general laws of a country. Either because of language difficulties or because of the short time available to them, it is often impossible for foreign experts to become acquainted with all the laws of the country where they are working. Therefore, the most they can do is to submit certain proposals, or indicate what articles should be incorporated in forest laws to achieve the forest policy purposes. In a first draft, such articles should be written in very general terms and the experts must leave it to the lawmakers of the country to draw up the final text. The ideal arrangement would be to have small three- to five-man committees, including, in addition to the expert, one, two or three legislators, one of whom should be highly competent in each of the following legal fields: constitutional law, administrative law, and civil and penal law; finally, if possible, one or two foresters from the country involved, preferably with some knowledge of the general laws in force there.

Of course, this in no way implies that the experts should not familiarize themselves with the national laws, since otherwise it would be difficult for them to enter into useful discussions in such a committee.

The points that require attention are:

Constitutional law

What guarantees does the constitution offer to private property, communities and associations? Is expropriation legal? When? How is power divided between the legislative, the executive and the judicial branches of the government? Is there a clear distinction between the last two? Is the government of the federal type? If so, what are the respective functions of the central government and the federated states or provinces, and what are the relations between the latter and the federal government?

Administrative law

How is the high administration of the country organized? Is it decentralized? Are regulatory powers delegated? What are the conditions of employment in the administration (stability, salaries, recruitment)? How are communities organized? Is appeal against administrative decisions possible for communities or private persons? What are the bases of fiscal legislation, how is the budget drawn up and distributed? Are accounts of revenue and expenditure kept separately? Does the government intervene in commerce (exports, industrial development, etc.)?

Civil law

What is the land tenure system (is private, collective or state property recognized)? Is there a distinction made between ownership of the land and ownership of buildings or improvements on the land? What usufruct rights, easements, rights of use exist? On what documents is ownership based? How can property titles or rights to use land originally part of the public domain be acquired? Is there a cadastral survey? Are grazing rights recognized? How is property transferred? How do co-operatives work?

Penal law

How is the judiciary organized, particularly the courts responsible for enforcement? How are violations of the law classified and what courts are competent to deal with them? How is the police organized? What weight is attached to the depositions of police officers in the courts? What are the rights of persons having police powers as regards arrest, seizure, searching private homes, interrogating witnesses, etc.? What is the appeals procedure? Are administrative or police officers empowered to settle disputes in certain fields?

The forest act submitted to the government in draft form must, first and foremost, be simple.

Though such an act need not be immutable, it must be durable and serve as a basis for government decrees and administrative regulations that can be modified and adapted to changing circumstances, though still remaining within the act; hence, it must be drafted in very broad terms.

In most countries in which technical assistance programs are being operated, the forest services are small, with a minimum number of professionals, whose technical activities are therefore extremely limited. The forest ranger corps is somewhat more numerous, but the technical training of rangers is usually elementary, so that they are merely expected to be able to read, write and carry out the simplest policing and surveillance work.

Consequently, a multiplicity of complex legal clauses initially would be useless. The aim essentially is for subsequent development by means of regulations or decrees. In other words, the act should impart the proper guidance and provide a framework to be filled in by such regulations.

This last point raises the question as to what are the essential points that need to be included in a forest act — a question to which an answer will now be attempted.

A. Who is responsible for the enforcement of the act?

In its very first articles the act must state clearly what agency is responsible for its enforcement.

Since direct management of state forests or supervision of the management of other forests is essentially a technical matter, a forest commission might be contemplated, or some other agency entirely independent of any ministry, with its own budget and accounting system, or even some semigovernmental agency that enjoys great autonomy. Such a solution is not to be recommended in countries where political circles have barely become aware of the value of forests and where wide support for forestry development must be aroused in these circles if success is ever to be obtained. On the other hand, if timber and forests are destined to play an important part in the economic and social life of the country, a special ministry, such as already exists in many countries, may be set up. Usually the government agency enforcing the forest act is attached to some already existing ministry (which we shall here assume to be the Ministry of Agriculture) and this ministry must be mentioned in the act as responsible for its enforcement.

In countries which already have well-organized forest services (even though funds may be short) firmly attached to the Ministry of Agriculture, it is not even necessary for the act to mention which agency of this ministry has powers of decision and execution or certain special responsibilities. References such as: "The Minister of Agriculture, on the report of the Director of the Forest Service, may (or shall)..." should therefore be eliminated. Indeed, the minister will organize the forest service, announcing its specific duties to ensure its proper functioning and possibly delegating certain of his powers to it. This is essentially a task for the executive and the text of the act need not enter into details. Naturally, if certain basic or final decisions have to be left to a body higher than the Ministry of Agriculture (the cabinet or the chief executive, for example), the act should mention the fact.

There is no need, either, to make particular mention in the act of bodies other than the forest service that are also under the Ministry of Agriculture. Even if these services have to intervene to enforce certain articles of the law, it is still for the minister responsible to direct such intervention.

On the other hand, although the Ministry of Agriculture is responsible for the general enforcement of the forest act, it is practically inevitable that other ministries should also be concerned with the enforcement of certain of its articles. These ministries should be mentioned in the act, as well as the general manner in which they will co-ordinate with the Ministry of Agriculture for the enforcement of the articles in question.

One ministry which will almost inevitably be involved is the Ministry of Justice, since it will have to enforce the penalties laid down by the forest act. That is why the procedure for ascertaining offences and submitting reports on them to the judiciary must be broadly defined in the forest act, unless such questions are automatically settled by investing the forest service officers or rangers with police authority (something that should be explicitly mentioned in the act if such is the case). Certain particular points regarding the enforcement of the forest act may need to be specified (see below).

If a forest service is already well organized as a permanent body within a ministry, there is no need for special mention of it in the act; if this is not the case, there may be good reason for mentioning it. An article setting up a forest service may invest the minister under whom it will function with broad powers to recruit staff and procure the necessary funds for its operation. However, even in this case it is not advisable for the law to be overexplicit as regards the tasks entrusted to this service or to specify its internal structure, as this might detract from the prerogatives of the executive. It might merely be mentioned that its tasks are technical, comprising research and training of lower grade staff

(and possibly even of higher officers), but primarily it will be expected to assume the responsibilities attributed to the minister by the forest act and possibly by other acts, responsibilities which he in turn delegates to the forest service.

Mention has just been made of "other acts" and, indeed, attention should be drawn to the fact that it is not the forest act alone that necessarily regulates everything concerning woodlands and forests, since forestry is only one form of land use and timber only one commodity. It is in fact wiser to limit the compass of the forest act, otherwise there is a danger of dealing with diversified subjects involving such varied interests that the bill of law may never be passed. The rule should be to deal only with subjects in which the forest service will have the main essential responsibilities. An act is always an act and applies to the entire subject matter it covers but it would be absurd, for instance, to change a constitutional law into a forest law. A certain amount of discernment is necessary to know the limits beyond which a forest act should not go. For instance, if tax exemptions or relief are to be granted to private owners for setting out new plantations, the provisions to this effect should appear in the forest act as well as in tax laws where they also belong. If they are to appear in the forest act, they obviously are also of concern to the inland revenue department. As mentioned above, a forest act should, in broad outline, establish the relationship between the latter department and the Ministry of Agriculture (details being left to interministerial regulations). For instance, the Ministry of Agriculture may make a report to be transmitted to the inland revenue department on the setting out and management of new plantations. The forest act may also incorporate regulations on the timber trade, import and export privileges or restrictions, the organization of forest industries or of lumbering camps, etc., if and where these points are not left to other laws.

Finally, if it is intended to set up an entirely new forest service constituting either a new ministry, a government body, or a quasi-governmental agency more or less independent of any ministry, the forest act must obviously contain details on its organization, its tasks and their limits, its powers, its relationship with existing ministries and various executive and judiciary bodies, the method of staff recruitment, its budgetary sources and, finally, the supervision of the new body by the government's higher executive branches.

It is all the more necessary to include these points in an act if the usual functions of a forest service are divided up among several bodies belonging to different ministries or are assigned some to regular ministerial agencies and others to more or less independent bodies. Such combinations may well be useful or even necessary but cannot be efficient unless relations between the various interested bodies are clearly set forth in the act, at least in broad outline. In any case, it should not be forgotten that the forest policy, which is an integral part of the economic, social and land use policy of a country, must be under government control. A body that merely manages government property may be allowed as much autonomy as it wishes once the principles of such management and its supervision have been defined, but no independent body can impose a forest policy on the government.

B. To what should the act apply?

As already mentioned a forest act should confine itself strictly to its own subject. Some of its provisions should or can apply to the entire country as, for instance, regulations on the timber trade, import and export duties, taxes on forest holdings, etc. However, provisions of this type may be included in other acts — preferably so if the forest service is not the main agency responsible for their enforcement. Other provisions generally applicable to the entire country that will necessarily be included in the act precisely because the forest service will usually be the responsible agency may, for example, cover timber transport, forest fire fighting, protection against tree diseases, bans on felling of certain species that should be conserved, the setting up of sawmills and other wood-using industries, etc. (see below).

The essential characteristic of a forest act is that the majority of its provisions, and the most important ones, should refer to certain well defined areas of the country, called "forests," for the management and/or surveillance of which the forest service will be responsible. The act must, therefore, make very clear what is meant by the term "forest," otherwise it will be null and void.

Unfortunately, the legal definition of a forest by mere description of its characteristics is impossible. As everyone knows, for various reasons a fully stocked forest with tall standards may not come under the term "forest," whereas absolutely bare land may be included. Furthermore, forests, wooded pastures and true pastures are sometimes barely distinguishable. There is therefore no alternative: the first articles of a forest act must be explicit as regards the areas to which the term "forest" refers, which means that they must make provision for the demarcation of these areas with boundary marks, ditches or other physical signs. These are the essential articles in a forest act.

The above statement must be thoroughly understood. It means that any area demarcated according to the procedure outlined in the articles of the act will automatically come under the act (and that a new act wil not be necessary for each demarcated piece of land). On the other hand different provisions in the forest act or other acts may apply to nondemarcated areas. For example, it may be as well for the forest service to give its advice or permission for felling of trees by private landowners or government services on areas that are not yet, or that never will be, demarcated. There is no need for a forest act for this purpose. The essence of such an act is that it applies mainly to strictly defined and clearly delimited areas (*see* Principles of

forest policy, Resolution No. 26, adopted in 1951 by Member States of FAO).[1]

In countries with properly compiled land registers or cadasters that are frequently brought up-to-date and in which, for each plot of land, the nature of its use is indicated, all land registered as forest may legally be considered as such. Even in this case, serious difficulties often arise where there are no physical landmarks. However, in only a few countries or in a few nonforested parts of each country are there such cadasters. There are none in countries where forestry is still in its infancy or where the distinction between forest lands, farmlands and pastures is still under dispute or may change with time.

Consequently, the most important articles of a forest act are those which provide for demarcation of the lands to which this act will apply and which stipulate in broad outline at least the procedure to be followed for this delimitation.

It must be added that the act may distinguish between several types of forest (for instance, protection stands, production stands, etc.). Since different rules or restrictions will apply to each of them (this being the main reason for making distinctions), these various types of stands, if contiguous, must be demarcated physically in different ways.

There will always be at least two types of stands, those that are state-owned and those privately-owned or belonging to communities.

If no government control is imposed by law on stands that are not state-owned, they need not be defined, delimited or demarcated. Even if certain advantages are granted, for instance, to private stand owners with no concomitant control or restrictions, such operations would be useless. On the other hand, when the act makes provision for any type of supervision or restriction (as, for instance, forbidding clear-cutting in order to modify land use) delimitation and demarcation must still be carried out, as otherwise the act would be inoperative. Depending on the nature of the restriction, such delimitation may be vague or detailed. If a specific restriction or obligation is imposed, for instance, on private stand owners in a certain area, it may suffice to have the private stands in that area delimited as a whole rather than each one individually. If complete control, similar to that exercised in state-owned stands, is imposed on all private stands, each of them must be completely marked off from other land, whether considered as under forest or not, and from adjacent public or private stands.

Delimitation and demarcation of private stands should generally be the task of the public service empowered by the law to supervise them. Where, however, private owners are granted certain advantages, which may or may not derive from this supervision, the cost of delimitation and demarcation and even their execution may be required of the owners in exchange for these advantages. The act should be precise on these points or at least lay out the main provisions regarding these matters of demarcation.

At all events, for countries with large forests, the physical tasks of delimiting and demarcating will inevitably demand a lot of time even where modern techniques, in particular, aerial photography, are used, since even these are no substitute for ground surveying and delimitation work. Even assuming that a country has a large enough staff of foresters and that this task is considered among the most urgent, priorities still have to be established.

It is not for the forest law to go into such details and perhaps for a very long time to come vast tracts of woodland will inevitably remain without surveillance. Consequently, temporary arrangements may have to be considered. Generally speaking, however, such expedients should be avoided. The act, assuming that there is an adequate forest service for enforcement purposes, may of course contain provisions of a very general character, like those mentioned above (prohibition of the felling of certain species, control over raw timber hauls, obligation to report the setting up of sawmills); it may even require the forest service to give its advice on these matters and supervise lumbering concessions. However, if this is envisaged, it would be either as part of a land settlement project or because it is felt that the forests have been made accessible and can therefore be brought under a regular management system. In either case, it is necessary to delimit the stands which will be permanently subject to the forest act. Beyond this one cannot go. To demand the enforcement of the law on forest land that is not delimited would impose responsibilities upon the forest service without giving it the means and powers to carry them out.

Furthermore, woodlands which have not yet been delimited under a forest law are not thereby without legal status. They may be private property, and as such governed by laws applying to all private property, or they may be state-owned — "fiscal land," to use the Latin-American expression. The latter are usually managed by special services often attached not to the Ministry of Agriculture but to another ministry (Land and Land Settlement, for example), whose duties include the enforcement of laws for agrarian reform, land settlement, etc., which apply precisely to these lands. Such laws determine the procedures for the alienation of state land for agricultural or industrial development and may specify that the Ministry of Agriculture (and, hence, the forest service) be consulted in the course of these procedures. This provision is the hallmark of wise laws concerned with safeguarding national forests and organizing close co-ordination between all the services of a country responsible for sound land use. However, if they do not contain provisions of this nature, *it is not* the forest act which must introduce them into national legislation. Progress along these lines should rather be sought by the introduction of proper clauses into acts governing state land as a whole.

[1] *Report of the Sixth Session of the FAO Conference, Rome, 19 November - 6 December 1951.*

The fact that such provisions are not included in these laws in no way prevents the drafting and promulgation of a good forest act. Since such an act will first of all call for delimitation of stands and since, as we have seen, an order of priority must be established for the physical task of delimitation and demarcation, it is clear that these operations should apply first and foremost to stands in zones where state land is being settled (legally or illegally) or in areas where this process has already been completed. In fact, delimitation is less important for stands far from inhabited centers or farming and grazing areas, stands that are as yet inaccessible and virgin, and which may not be opened to logging, either on a regular or occasional basis, for several decades to come. It is only in certain cases where fire prevention may be necessary that delimitation becomes important. However, this is much more a technical than a legislative problem. Consequently, delimitation work should be centered on lands under forests or to be afforested or reforested, where competition between farming, grazing and forest use is already a problem or is likely to become so at any moment.

The setting of priorities is the task of the service empowered to enforce the act. As we have said, the main lines of procedure for stand delimitation should be prescribed, this being a very important point in countries where land settlement for farming is taking place. Normally, this procedure should provide for the investigation of land titles of owners or occupants of forests adjacent to stands to be delimited, as well as the determination of the areas over which these titles extend. Hence, the act should require landowners and adjacent occupants to participate in this procedure and provide systematic protection of their rights. But what can be done where land has no owner or apparent occupant or if the occupant cannot prove his title? It should not be forgotten that the stands to be delimited have been taken, by virtue of a forest act, from state land which is managed under another act (either a land reform or land settlement act) by a special government body or ministry. The act should therefore also provide for the organized participation of that body or ministry in this delimitation procedure, thus avoiding difficulties that might arise later from unilateral action.

Considering the uncertainty that still exists in many countries regarding differentiation between farm and forest land, the forest act should not state that delimited stands governed by the forest law are inalienable. On the contrary, it should prescribe a procedure for relinquishment or cession under which the body managing state land would also be required to intervene under conditions set by the forest act. However, lest this procedure lay itself open to abuse that would endanger the stability of forests, and therefore the scientific working of stands, the procedure should be quite rigorous and should be concluded by the highest executive authority, for instance by a ministerial or interministerial decree.

A forest act, as we have said, cannot define by enumeration of its characteristics the land to which it applies. It can only prescribe that such areas be delimited physically. However, in order to help the officers in charge of ground survey work, it could well set forth certain rules enabling them to choose those portions of the national territory to be included. These rules may be appealed to when claims against the suggested delimitations come up to the effect that these officers have gone beyond the law. However, such rules should not be confused with the legal definition of a forest. The act may state, for instance, that, in principle, all land with over 50 trees to the hectare should be included in the legal delimitation of stands. This is one possible criterion. It would be inadmissible, however, for the act to stipulate that every plot of land with over 50 trees per hectare is to be legally considered as forested land. This would be an attempt at a legal definition of a forest on paper which would be doomed to failure for readily understandable reasons and which would render any forest act null and void.

The criteria and definitions may vary greatly from country to country and will be determined mainly by the proposed forest policy. The following are only some of the possible definitions of forest land:

1. land with a more or less dense cover of trees;
2. the same land, but with the proviso that it will not be farmed for a fairly long period of time or that it is definitely unsuitable for agriculture;
3. land more or less densely covered with scrub;
4. land which can be managed on a sustained yield basis (for the production of fuelwood or timber);
5. multipurpose land (grazing land) where timber production has a certain importance;
6. land which must remain under tree, brush or grass cover in order to protect the soil and water and prevent erosion, avalanches, etc.;
7. bare land or land with a thin cover of trees which should be totally or partially reforested for protection purposes;
8. land to be reforested for economic, social, health or recreational purposes.[2]

---

[2] The following definitions, which Swiss authorities feel should be incorporated in their cantonal forest laws, may serve as an illustration:

" (*a*) All land managed mainly for timber production.

" (*b*) All land on which trees grow, even though it may be used for several purposes, for example, forest grazings and chestnut groves.

" (*c*) All land, the cover of which serves a protective purpose, including pastures where alder (*Alnus* sp.) and pine (*P. mughus*) grow.

" This does not cover isolated trees except for chestnuts with a d.b.h. of 20 centimeters and more, small woodlots and plots of brushwood on farm land, roadside plantings, gardens and parks. "

These definitions may be suitable in a country where the forests have long been an established feature (a federal law stipulates that the forest or woodland area is to be maintained at the present figure) and where there is a complete land cadaster and forest consciousness is highly developed. They are naturally not suitable for less developed countries, and are merely given here as an example.

Although the incorporation of such definitions in a forest act may be useful, it is not essential. What is essential is the procedure for the delimitation and demarcation of stands. In fact, the size and nature of the plots of land to be included under forest land is a question that must be settled by the forest policy of the country concerned. Many laws try to define forest land as land unsuited to agriculture. This is obviously much too vague an expression to define forest policy on this essential point, and to make possible its implementation (which is the prime object of the legislation).

On the one hand, it does not specify whether land used under a shifting cultivation system (that is, occupied, in a 15-to 30-year cycle, for two to three years or more for crop growing and left untouched for at least 12 to 27 years so that the trees may grow) should be incorporated in forest land regardless of the land tenure system. On the other hand, the term "agriculture" is also very vague and does not indicate whether rangelands, that is, natural grasslands, should or should not be considered as forest land. This lack of clarity is all the more serious as many types of vegetation, whether natural or planted by man, include both trees, some of them of great forage value, and grass swards and other forage plants, some of which may be industrially useful. In other words, there is sometimes no clear distinction between forests and natural grasslands, which explains why forests are all too often illegally used for pasturing. This causes their degradation as well as the despoliation of the grazings in the vicinity.

Finally, large stands which are still virgin or distant from farming belts often include land where stable agriculture could be established but only after a long lapse of time precisely because of the distances, whereas they can still in the meantime produce good timber crops. Should such lands be excluded from the forests to be delimited, in execution of forest law provisions?

What we have just said clearly shows the impossibility of defining the term "forest" and the necessity, in order to arrive at a legal definition, of first of all prescribing the delimitation and physical demarcation of land to be considered as under forest. In particular, one should avoid any reference to land unsuitable for crop growing or as pasture. It is far better that nothing be said on this subject, thus giving the land-use policy every opportunity to develop in the best interests of the country. The best formula seems to be to indicate in the preamble of the act or in one of the first articles that its purpose is to ensure the conservation, sound use and development of the renewable natural resources of the country or of the timber and other natural resources, or some other formula of this type.

From the standpoint of government policy, it is clear that if grasslands, belonging to the state or to communities, and used for pasturing livestock or shifting cultivation, are excluded from forest, i.e., from "forest" within the meaning of the law, they will generally be left without any technical supervision because countries with only young forest services are still less likely to have services capable of caring for natural grasslands and wooded areas used for shifting cultivation. Until better solutions are found, the responsibilities of the forest service should be extended to these lands in order to avoid the misuse and sometimes irreparable damage which often results from unsupervised use. However, as already mentioned, decisions on this matter must be made when the government lays down its policy. Obviously, if the government does not wish to impose any restrictions on the use of such lands, they need not be incorporated under forest land or discussed in the forest act.

Many texts of forest acts begin with an article recognizing that the conservation or development of natural resources and forests is in the public interest. The wording of these articles may be extremely important if the legislator wishes to empower the ministry concerned to resort to expropriation measures in order to keep certain sites under forest or promote their afforestation or reforestation. The wording used may determine the legality or otherwise of the power to expropriate, as governed by provisions in the civil, administrative or constitutional law of the country.

If the policy decided upon aims at obtaining from the legislature enabling powers for a ministry to expropriate land, the text of the act should obviously be drafted in such a manner as to define the cases where this power may be exercised. It is very unlikely that such an act would be passed if the instances cited permitted too broad an interpretation.

Actual expropriation procedure does not have to be specified in the forest act, which need merely refer to other more basic legal texts on this subject. Only if it is intended to introduce restrictions on this more general law or, alternatively, to facilitate its enforcement by certain special provisions, should such amendments of the general legislation be incorporated in the forest act.

C. Provisions pertaining to forest working

In many cases when a forest officer assigned the task of delimiting a stand makes a ground survey of the area, he finds that far from not having been used or having been used only by its lawful owner (assuming that land titles are proven), regular exploitation is being carried on by private individuals or nearby communities. The gathering of wild fruit or other forest products as well as the pasturing of livestock or shifting cultivation may also have been practiced there for a long time.

In order to enable the surfaces which are to be marked out on the land to be used for the purposes laid down in forest policy, it is indispensable that the nature, importance and means of exercise of the rights of use be perfectly well known (unless the act provides for the outright elimination of all such rights in the delimited forests in execution of the forest act — a drastic measure which can and should be considered only rarely). It is obviously important to free newly-delimited forests of all servitudes which encumber them, but the methods

of doing so, which clearly call for compensation, are long and difficult and it is usually preferable to wait for subsequent legislation to stipulate the correct procedure. The immediate aim will be simply to control such rights and confine their exercise within limits designed to ensure that they shall not endanger the stability or fertility of the land in question in such a way as to render impossible the exercise of such rights thereafter.

Hence a forest act which prescribes delimitation of forest lands should also call for the listing of all rights of use (indicating the nature of these rights, their extent, conditions governing their exercise and the identity of the persons involved). While considering the need both to respect and to regulate rights of use, forest policy should aim at sustained yield of stands.

What therefore are the basic provisions that the act should contain in order to achieve this result in the easiest possible way?

State-owned forests

Theoretically there is no difficulty. The act should contain an article stipulating that one of the tasks incumbent on the forest service is to place each stand under an officially approved management plan.

There is the practical difficulty, however, that any serious study of a management plan inevitably takes a long time, and hence the act would have to contain not only the provisions governing the sale of forest products (both direct sales and long-term logging concessions) but also indispensable guarantees that such sales or concessions contracted prior to the approval of the management plan will not imperil the stand's future productivity. The granting of long-term concessions might be conditional upon the submission by the beneficiary of a technical management plan for his entire concession period. He might even be required to demarcate the boundaries of the stand in question, thus simplifying the work of the forest service, though the latter would ultimately remain responsible for ensuring implementation of the management plan as well as of the demarcation work.

There is no point in including in this chapter of the act provisions regarding sales prices of products or the obligations of the concessionaires. All this can more properly be done in subsequent regulations. At most the act should enunciate the principles governing the grant of long-term concessions and the sale of products (for instance, at public auction).

Community-owned forests

A choice must be made between placing stands under a management or working plan analogous to that for state-owned forests (under the absolute control of the forest service), allowing them to be handled as privately-owned stands (see next section), or some intermediate system. In any case, it should not be forgotten that, if there is to be some form of control, the stands have to be demarcated and, if a system other than that for privately-owned stands is chosen, a special delimitation would have to be made, probably of each stand separately. If the first alternative is chosen, the particular needs of the community which owns the stand have to be considered in the management plan.

Privately-owned stands

1. If these are very large and there are many owners, any form of control is a heavy task for the forest service (which, being perhaps of only recent creation, may be unable to handle it).
2. Extremely strict control, accompanied by very severe penalties for violations of the law, involves the danger of smothering any initiative on the part of private owners, so that they lose interest entirely, which, unfortunately, they are all too prone to do anyway.

The preceding remarks serve to show that the act should only include the simplest duties that do not compel the forest service to carry out very rigorous inspection. Notice of all fellings and their authorization by the forest service, reports on cuts and full inspection by the service officials — all these are quite unrealistic measures. The most that can be suggested is that the act should lay down the principle that any owner who himself, or through others, works his forest stand (and not the logger) is obliged also to ensure the regeneration of logged-over areas, either by natural regrowth or by artificial plantings of species of equivalent economic value. The only sanction that should be written into the act is that which authorizes the forest service to demand the replanting of a cutover stand or itself take charge of such work at the expense of the owner if natural regeneration does not occur. The article on this subject should prescribe the main lines of procedure for forest service action in such cases. This procedure should include the possibility of landowners taking appeals to court, since the purpose is to protect them against exaggerated, unwarranted or retroactive demands.

More restrictions and regulations may be imposed with regard to stands classified as protection forests, although one should remember what has been said in paragraphs 1 and 2 of this section.

This division of the act should also include provisions regarding the compulsory stocking or restocking of stands and the possibility of expropriation in specific cases. Such articles should be framed with local laws on expropriation in mind and, if need be, these should be referred to in the forest act itself.

Another division should contain provisions on possible state aid to owners wishing to restock or improve their stands, build roads, etc., whether within the forest area or outside it. In the case of plantations outside the forest area, aid should logically be granted only if the newly-created or improved stand has been delimited and is incorporated into a forest area, except in the case of linear plantations, hedges, etc.

In this division the act may also include the financial

privileges which may be granted (with discernment) to owners who wish to restock or improve their stands, provided that it is not more in accordance with local custom to include such provisions in the finance laws.

Finally, if the country in question has the problem of fragmentation of private forest holdings, yet another division should deal with co-operatives of forest owners. To draft such articles, the expert will have to make a serious study of current acts governing co-operatives in other economic fields and particularly farmer co-operatives.

It must be recognized that in many countries demarcation lines and boundary marks, essential as they are, are not sufficient to force local populations to respect the property rights of either the state, communities or private persons. It is often the actual use of the land within these boundaries that, at least in the eyes of the local inhabitants, creates true title to the land. This concept is founded on ancient custom in some countries. That is why, at least for state-owned forests, and those which the act places under its control, this act should contain an article compelling the forest service to place all forests under officially approved management. If the delimited areas are almost entirely under true forest vegetation, such management will naturally be geared to lumbering and forest industries. Even in such a case, however, it often happens that the land is also used to graze domestic animals or as game preserves. If it is deemed necessary or desirable, for technical, economic or social reasons, to allow or, indeed, promote such activities (provided, of course, that stand yield is sustained), management for purely forestry purposes may be modified into management partly for forestry and partly for grazing and, possibly, for wildlife conservation as well. In such cases, the act should pronounce to that effect, as well as specifying possible use for farming if there are areas where shifting cultivation is practiced within the delimited stands.

The act may go even further and distinguish, at least as regards their main use, between the various types of forest. This, especially for state forests, would be more useful than the legal distinction most often made between protection and production stands. It may not be indispensable that a stand used essentially for grazing be distinguished, legally speaking, from stands where lumbering is the primary use, as the difference between the two types pertains mainly to how they are managed. In India, for instance, so-called forests often encompass vast expanses of range, and in the management of these stands working circles are set aside for grazing. On the other hand, when parts of the forest are used for farming or shifting cultivation, it is theoretically necessary to distinguish between two types of forest, because usually the laws relating to them are quite different. This, actually, is the solution reached in many countries of Africa where some forest reserves are strictly protected for timber production or soil and water conservation, while in other forests, called by various names, restrictions are much vaguer and more lax. Unfortunately, all too often in the latter case such restrictions are entirely inoperative precisely because such stands are not delimited or marked out, all efforts along these lines being confined to forest reserves.

The problem here is linked with rights of use. As already mentioned the forest act must wherever necessary make these rights the object of regulations. It is in the chapters on the working of stands that such regulations find their normal place, whether they apply to the cutting of timber, to the grazing of animals or to shifting cultivation. In countries where rights of use exist *de facto* or *de jure*, it is useless to seek to delimit forest areas unless it is government policy to regulate the exercise and scope of such rights. In fact, it is absolutely useless to promulgate a forest act if these rights can be freely exercised everywhere.

Regulations governing such rights of use should respect acquired rights insofar as possible (with the above-mentioned reservations regarding elimination of such rights by destructive exercise), and this is normally feasible. It often happens that wise regulations make possible not only the exercise of such rights without any danger to the forests but even with certain advantages to the latter. The right to practice shifting cultivation, for instance, can be used for setting out plantations (under the ' taungya ' system), grazing rights for eliminating fire risks, etc. It is still necessary, however, that the act should lay the bases for the regulation of such rights.

In order to avoid the indefinite extension of rights of use, either in number or area, before legally prescribed stand delimitation is carried out, one precaution must be taken in framing the act itself. It must contain an article stipulating that only rights of use already in existence on state land at the time of the promulgation of the act shall be recognized. This may possibly be extended to property rights if, as is the general case, continuous occupation of land for a long period of time establishes title to it. However, this is something to be considered more by the agencies administering state land in general, and a forest act is therefore not its natural place.

Articles prescribing how delimited stands are to be managed, and the manner of carrying out the resulting work look beyond mere establishment of property rights in such forests. The act should be so drafted as to emphasize how the restrictions it sets on forest use are balanced by advantages, not only to the entire country but also to local communities in the vicinity of forests who will naturally be the most affected by any restrictions imposed. Thus, the act may well prescribe that communities may extract whatever timber they require from forests and that this shall have priority over the supplying of any other demand, or that local labor should be given priority over any other as regards forest work, etc. It may even stipulate a procedure for relinquishing a certain portion of a forest to a nearby community, although this area will still be under the supervision of the forest service. Such provisions are often a great help to communities in their economic and social development.

D. Stand protection provisions

In this connection it is also necessary to be realistic. It is entirely useless, for instance, to prescribe that owners must take pest control measures which it is clearly impossible to execute and supervise. As a rule, pest control measures are a purely technical matter and therefore not the immediate concern of the act. In the case of state-owned forests the question does not even arise, since the forest service is responsible for taking all technical measures necessary and for this no law is needed.

Where much of the land is privately owned it should also be remembered that stand protection should be organized not only for the benefit of state-owned stands, but also for forests belonging to other owners. No matter how little interest an owner shows in his stand, he is as much concerned as the government that nobody should settle there without his permission, that no trees be stolen, that no fire be started, either willfully or through negligence, and that no grazing be carried on without his permission. It is to be hoped that if private owners are guaranteed security in these respects, they will begin to take an interest in their forests.

How can this be achieved?

In certain countries legislation provides for contracts whereby the forest service undertakes the management of private stands for a specified fee. Provisions of this nature, however, may remain ineffective because landowners usually show little inclination to have the forest service intervene in their affairs.

One suggestion is that the forest act concern itself exclusively with the protection of state forests (except as regards certain points on the use of fire in stands and on forest fires in general — these will be discussed later — and, if deemed feasible, clauses on pest and disease control). A clause would then provide for the extension of such protective legislation at stand owners' request on very simple conditions, for instance, that each owner should have his own stand delimited and submit the survey map to the forest service (it is difficult to conceive how protective legislation can be applied to any stand unless this preliminary step has been taken).

In order to interest private owners in this arrangement, they must derive definite advantages from the penalties attached to violations of the forest act, their ascertainment, and the submission of proof of the offenses to the authorities. The law in all countries punishes theft, and the theft of wood from a forest is a theft like any other; it punishes use of another person's property without his prior consent; it punishes the starting of fires, whether willful or otherwise. The penalties contemplated in a forest act have, therefore, to be more severe and rigid, this being justified in many instances by the fact that damage caused to a forest is to the material and economic detriment of the entire nation. Or else the procedures for the ascertaining of an offense, its investigation, seizure, etc., should be simpler or the judicial processes more expeditious; or better still, all these conditions should be combined. Therefore, before making proposals regarding the organization of stand protection, it is advisable to study current legislation on these various points, particularly the general classification of violations of the law, rules of evidence applicable in the various cases, and the corresponding forms of judicial procedure, including appeals procedure.

The act should, generally speaking, call for stand protection along the following lines, though the importance of each point will very greatly from country to country.

Protection against trespassing on forest land whether for agricultural use or any other purpose

In countries where there are a great many squatters, the particular laws on this subject should be carefully studied. Occupation of forest land should be prohibited even if no trees or bushes are cut or mutilated.

This chapter of the act may include articles of very special character, since they apply essentially to forest owners, namely articles on the clearing of stands, i.e., the removal of trees in order to use the soil for other purposes, either by the private owner himself or, with his consent, by another.

Should the above suggestions regarding delimitation of stands be accepted, the articles on clearing of forests will logically refer only to land within the limits of private stands. Conditions governing the grant of clearing permits will be more or less strict, and the penalties laid donn for violations will be fairly heavy or light, depending on the forest policy adopted. Among these conditions it will be absolutely essential to include provisions making it compulsory for owners to demarcate the plots they propose to clear, thereby automatically establishing the revised boundaries of their forest land.

Protection against unauthorized or clandestine cutting or extraction of timber or forest products

Nothing special need be said on this point, save that the act should perhaps not consider as an infraction certain unauthorized fellings during *bona fide* logging operations, since it is inevitable that some trees should be accidentally cut down or mutilated during the operations. The indemnity that the State or the owners must be paid for such fellings or mutilation may be stipulated in the logging concession or sales contract.

It may be useful to list clearly all legally protected forest products in order to avoid any controversy regarding products of obvious general economic value (such as gums and resins) and also so as not to interfere with the collecting of products that are of value only to the local inhabitants and which would go to waste if not gathered and used by them (wild fruit, deadwood, etc.).

Protection against unauthorized grazing

On this point also nothing special need be said except that in principle it is best to lay down different penalties for the grazing of the various types of livestock and particularly heavy penalties for grazing of animals in artificially planted stands.

Protection against fire

When fire is an important destructive agent, the drafting of this chapter will present particular difficulty and require extremely careful attention if the provisions are to remain within the practical scope of the law.

First of all it should be pointed out that it is useless to have fire control, detection and prevention measures included in the act. Such technical measures are the concern of the forest service in state-owned forests, and that of the owners in private stands. The only preventive measure that should be included in the act is the stipulation that forest owners must open up firebreaks and keep them clear. Even this would be too much to expect in countries underdeveloped from the forestry point of view. Here the most that could be done would be to insert in the articles on privately-owned stands (see Section C above) reference to state aid to stand owners who wish to open up firebreaks or take other steps to prevent fire, such as the joint purchase of fire-fighting equipment, organized patrolling, etc. Such cases would be rare in these countries.

The act must therefore confine itself to:

1. Holding the person proved guilty of causing the fire responsible for any damage in a state-owned forest. In addition to the penalties contained in the national laws against any person causing fire voluntarily or involuntarily, the penalties for the cutting or mutilation of trees can be applied, and these penalties increased for damage caused by fire.
2. The prescribing of the necessary restrictions on the lighting and conveying of fire in a stand or within a certain distance from the limits of a state-owned stand. These may be more or less severe depending on the season of the year and may even go as far as prohibiting access to stands when climatic conditions heighten the danger of fire. In such cases the act should stipulate whose responsibility it is to declare closed seasons, the responsibility being decentralized as far as possible. It is not necessary that the person responsible belong to the forest service, though the latter should be consulted and may possibly impose these measures.
3. Establishing the responsibility of the authorities in case of reported fire. This may be of two types: on the one hand technical responsibility, which should lie with a member of the forest service, and, on the other hand, the organization of rescue and fire-fighting measures. The latter could very well be entrusted to a government official or representative with authority over the various civil or military services or groups that can help in these measures, particularly the army, transport officials, and the postal and telegraph services. It is essential that both these types of responsibility be decentralized as far as possible. Within each district it might therefore be advisable to vest them both in a single person, especially since at first there will be only very few forest service agents. The act should empower the authorities responsible for the organization of fire-fighting and rescue measures to move men and vehicles as required.

Whereas articles under paragraph 1 above should apply exclusively to state-owned forests (except as they are extended to private stands invoking the principles of Section D, those under paragraph 2 may apply either exclusively to state-owned forests or to all forests. Articles under paragraph 3 are necessarily applicable to all forests.

If the measures under paragraph 2 are considered inadequate, additional articles can be incorporated governing the lighting of fires for specific purposes (burning over for pasture renewal, fires lit during hunts or for shifting cultivation, etc.). Naturally, it is completely unrealistic to expect to regulate all fires of this type in any given country. However, regulations might govern the lighting of fires near forests, whether they be privately- or state-owned, or fires which threaten to reach the limits specified in paragraph 2. The authority empowered to allow the lighting of fires should also be decentralized. It may, for example, be the same authority that will have to organize aid in case of fire. Permission to light fires may be granted only under certain conditions, for instance, only if the authority's representative is on the spot. In any case, anyone who has a permit to start a fire is thereby exonerated from any responsibility if the fire spreads to a forest, unless he has failed to comply with the conditions laid down, otherwise there would be no point in requesting such permits.

E. Provisions governing logging concerns wood-using industries and the timber trade

The forest act need not contain detailed provisions with regard to private lumbering and timber processing or wood trading. Most matters in which the act intervenes in the case of such enterprises are already covered by other laws more general than the forest act and therefore responsibility for the enforcement lies with other government services or other ministries. Such is the case, for instance, with laws governing the relations between employers and workers, fiscal legislation, laws on the importing of machinery or other requisites, as well as the export of forest products. There is no doubt that in a country where sawmill equipment is outmoded because of difficulties in importing the necessary machinery, there arises a temptation to introduce into the forest act measures to facilitate such imports; but the forest act is not the proper place for such measures. This does not mean that the expert who advises the government should not call its attention to such matters and try through the usual legal procedure or regulations to have the situation improved.

Although the forest act should contain only a few provisions pertaining to such enterprises, they are important ones. Before enumerating them, it must be

stressed that the act should not include provisions that hamper the normal activity or the development of such enterprises, which alone can work the stands to advantage.

Unfortunately, provisions of this sort are all too frequent. Checks on the hauling of timber along roads may facilitate supervision over logging, and in some countries the government's only revenue from its forests may be the fees imposed for the permits to transport timber. However, it must be repeatedly emphasized that this is not the best way for the State to derive revenue from its stands. It should sell the wood from the stands it owns at regular prices, and should tax transactions involving wood cut in privately-owned stands; but it is a hindrance to loggers to have taxes and sales prices tied to the transport of wood. Moreover, where there is only a small forest ranger force, this control over road transport absorbs all its energy and does not allow it time to carry out its technical or policing duties in the stands. Consequently, tax collection on timber transported on the highways is a measure that should be used very sparingly. In case of doubt, in this connection as well as with regard to any other measures that may prove harmful, it is usually possible for the law to lay down the principle that the government has the power to apply such measures throughout the country or in any part of it, and then to leave the practical application and detailed execution to enabling decrees or regulations based on the act.

The essential functions of the forest service as regards lumbering companies are:

1. To ensure, as far as possible, sufficient supplies of raw material to any and all existing or future firms, without danger of impoverishment or destruction of the forest stands, it being understood that such undertakings should use the raw materials in the best possible manner with the minimum amount of waste.
2. To check on the production of such enterprises, merely for statistical purposes, to make certain that no imbalance is provoked between timber growth and cut.

Consequently, when any country plans to set up new industries or expand existing ones and a government licence is required for the purpose, the forest act should specify that such licence may only be granted after the forest service has studied the matter and examined the stands which the firm will work, as well as that firm's machinery and workmen. Even when no licence is required for starting these new industries or expanding existing ones, the forest act should require such preliminary investigation and have the findings submitted both to the government and to the interested parties.

Furthermore, the act should prescribe that the forest service shall keep a register of all proposed and existing lumbering concerns, whether industrial logging firms or timber trading companies, and that statistical data shall be regularly submitted for the exclusive use of the service.

F. Manner of ascertaining and punishing violations of the forest act - Penalties

Most probably the general penal law of the country establishes several categories of offenses and, for each of these categories, the procedure for judicial inquiry, seizure, and trial, the payment of fines, etc., as well as the jurisdiction of the various courts, appeals procedures, etc.

The forest act must of necessity specify in what category offences against this law shall be placed.

This simple specification will probably suffice *ipso facto* to give all directives as to the ascertaining and punishment of offenses against the forest act. All that is necessary is to revise certain details that do not apply, or apply inadequately, to the infractions committed in forest stands, that is, usually in very isolated places with no communication facilities. Consequently, some of the articles of the forest act will have to mention these details and specify the relevant legal procedure. This may be particularly the case as regards confiscation of livestock for infractions of clauses regarding grazing, or of sawmill equipment for breach of rules relating to the felling of trees, as well as the penalties in the case of aggravating circumstances, repetition of offenses or complicity in breaking of statutes or regulations.

In studying these possible modifications of, or additions to, the general penal law, the principle stated at the beginning of Section D must be borne in mind: namely that the procedures for ascertaining and investigating offenses, for seizure, etc., should be as simple and expeditious as possible, though naturally in accordance with the basic principles of the country's general legislation.

The forest act must explicitly stipulate who is authorized to report that the law has been broken or more exactly (since in principle all state police should have authority to act in case of lawbreaking) it must stipulate whether members of the forest service do or do not have police powers. If need be the staff of such a service could confine itself to technical responsibilities, and in the case of an infraction of the forest act merely inform a member of the police force who would then proceed to report the offense and investigate the case. This may suffice for certain types of infractions of the forest law, but would make it too difficult to prove the committing of an offense, especially in connection with protection stands. It is difficult to imagine that a forest ranger who discovers a person illegally cutting down a tree, would run to find a member of the police force in order to report the offense. Consequently, the need for giving the forest service police powers, at least as regards violations of the forest law, must be emphasized.

Investing rangers with such police powers would in itself have various consequences as regards their rights in the investigation of cases (access to private homes, for instance), as well as regarding the value of their reports or their testimony before the courts, and finally in matters of arrests and seizure. Here again, the

provisions of the general laws may have to be simplified in order to meet the needs of the forest act.

On the other hand, it is important that no judiciary powers be given to the forest service staff in the projected act. Not only would such a provision be absolutely contrary to the spirit of modern constitutional law, but it would impose additional functions on the service entirely foreign to its nature.

True, in some countries forest laws confer on certain officers of the forest service the power of compounding the offense [3] but this power is in no way a judicial function, since the person presumed to have committed the offense may always refuse to accept the proposed settlement. This right of compounding the offense is moreover strictly regulated. It may be advisable to have such powers incorporated in the forest act, but on condition that all essential measures to safeguard their proper exercise are included.

If, as already suggested, private owners may in certain circumstances benefit from the provisions of the forest act as regards stand protection, it is important also that the act stipulate who must prove that infractions have been committed in protected stands. This police task may be assigned to forest service officers, but most probably, since there will only be few of them in the areas where forest property is already well developed, it may be necessary for the owners to recruit private keepers, approved by the forest service, for police duties similar to those of the staff of the service itself.

Finally, a chapter of the act should be devoted to penalties, though, of course, it may be advisable that in the case of certain articles involving penalties or certain types of penalty, the penalty should not be separated from the article where the offense is mentioned.

The question of penalties should be studied carefully without losing sight of the fact that many violations, in addition to being illegal acts, also cause material losses to the stand owner (whether it be the State or a private person) and adversely affect the future of the stand. There are three possible types of penalty, namely: fine (or imprisonment) for infraction of the law; return of the products extracted from the stand, or payment of the equivalent value; payment of damages. These are frequently, although not always, found in conjunction with each other.

In a forest act, however, only the first type of penalty should be prescribed, since the fine or length of imprisonment depend on the nature of the offense (for instance, the type and age of the trees illegally cut; the nature of livestock introduced into the stand; aggravating circumstances; and repetition of the offense). The two other penalties are variable by their very nature: no legal text can prescribe them, only a court can determine them. If the act is to offer inducements to private owners who are interested principally in recovering products extracted, or in being paid for damage inflicted, it is of the utmost importance that both these penalties be fixed by the same court which imposes the fine or imprisonment, and at the same time. The general penal law of the country may be so conceived that this condition is met. If not, the proviso should be introduced as far as possible into the forest act.

[3] i.e., to accept a summary fine in lieu of court prosecution.

G. Forest service budget and funds

Once the law has set up a forest service and vested it with concrete responsibilities, the government's annual budget should, as already mentioned, include the necessary funds to ensure regular salary payments to the staff and enable it to perform its normal functions.

In theory, the forest act is therefore not concerned with the budgetary funds for the forest service; at most it indicates the manner of submission of the forest service's budget, if this seems advisable or is the custom.

The new trend is for each country to have a forest service financially independent of the general budget, which uses its own revenue to cover its expenses and only deposits any surplus it may have with the treasury.

This system has obvious advantages. The great difficulty in new countries is to recruit forestry officers and pay them a salary commensurate with their professional and technical training and that allows them a standard of living that will enable them to fulfil their duties satisfactorily. An independent budget for the forest service can guarantee acceptable salary levels and material advantages. In addition, it allows the necessary funds to be devoted to stand improvement and regeneration, which are often indispensable after cuttings. It also enables the service to invest all or part of its surplus revenue in forest development work.

On the other hand, it should be pointed out that autonomy of this type also has certain drawbacks, not only because it partially deprives the government of control over the forest service officers, but also because, obviously, the best way of keeping the government's interest in its forests is hardly fostered by the assumption that it can derive no benefit from them or that any income therefrom may not be employed for more general purposes but only directly for the stands. This solution also involves certain risks if the forest service is inclined to underestimate the danger of more or less temporary overheavy logging. Finally, this solution is not always practicable. When a country has little woodland or the State owns only very little, or else when there are many forests either still virgin or barely touched, the main function or the forest service is to direct investment or undertake stand improvement or conservation of low-yield stands that are nevertheless important from the standpoint of soil protection and water supply. The result is that, for many years at least, the revenue derived therefrom is practically nil.

For this reason it is necessary to weigh seriously the pros and cons of such a system. If it is decided to set up an independent forest service, the act should sketch out how the budgeting for such a service, and its control by the State, will work.

Whichever system is adopted in countries that are just beginning to consider forest law and forest management, much capital is necessary for the improvement of existing stands and the planting of new ones. These are not what are normally called budgetary outlays. Not only does the forest service require considerable funds for such purposes, but they have to be provided on a sufficiently stable basis for it to venture on long-term projects.

The forest act may call for financing through a forest investment fund. Generally speaking, such a fund must be derived from one or several special taxes (logically, for instance, the taxes on sales of standing timber, on internal or foreign sale of the products of sawmills or wood-using industries). Nevertheless, care must be taken that such taxes shall be easy to levy and that they do not handicap the lumbering industries or the timber trade. If necessary the returns from certain stands (experimental stands or high-yielding plantations) may be set aside wholly or in part for such a forestry fund; but if the forest service has only a small staff, there is one danger that it will concentrate its efforts exclusively on this remunerative type of stand.

If a forestry fund is set up by the forest act, the act should also stipulate not only approved types of investment but also the general procedure for collecting the fund's resources and the method of state control over investment-type expenditures.

H. General outline of a forest law

To sum up, the following outline can be recommended for a forest law in countries as yet underdeveloped from a forestry standpoint.

Introduction – Statement of motives with a brief summary of the major forest policy lines.

Section I

(*a*) Definition of general terms used in the act.
(*b*) Authorities responsible for enforcement of the act.
(*c*) Classification of stands, if necessary (protection, national parks, etc.).

Section II. Delimitation of forest land

Chapter I. State forests

(*a*) Delimitation method.
(*b*) Recognition of rights of use.
(*c*) Management of wooded land that is not included within the boundaries of forest land or that has definitely been abandoned as wasteland (possibly).

Chapter II. Community stands

Chapter III. Privately-owned stands

Section III. Management of forest stands

Chapter I. State forests

(*a*) Compulsory management plan - Method of approval.
(*b*) Control of the rights of use.
(*c*) Disposal of forest products (by sale, by logging concessions, etc.).

Chapter II. Community stands

Chapter III. Privately-owned stands

Subchapter I.

(*a*) Obligations of private owners with regard to stand logging (a distinction being made, where necessary, between production and protection stands).
(*b*) Obligations of private owners as regards reforestation of barren land.
(*c*) Acquisition by the State of private forest holdings and possibilities of their expropriation.

Subchapter II. Various privileges, particularly as regards subsidies (possibly tax exemption, etc.).

Subchapter III (possibly). Forest owners co-operatives.

Section IV. Protection of state forests

Chapter I. Protection of stands and of forest products against extraction or deterioration

(*a*) Felling and mutilation of trees.
(*b*) Extraction of other forest products.

Chapter II. Protection against illegal occupation or trespassing

Chapter III. Protection against grazing

Chapter IV. Protection against fire

Section V. Protection of forests in general

Chapter I. General provisions (with special reference to fire prevention)

Chapter II. Application of the provisions under Section IV to stands owned by private persons or communities

Chapter III. Clearing of stands

Section VI (possibly). Financing the forest service

(*a*) Budgetary regulations.
(*b*) An autonomous national forestry fund.

Section VII (possibly). Exploitation, industry and commerce of forest products

(*a*) Installation of forest industries.
(*b*) Transport of timber.

Section VIII. Infractions of the forest law

Chapter I. Police powers of forest service officers

Chapter II. Procedure

(*a*) Classification of infractions.
(*b*) Proving the committing of offenses; confiscation of illegally-extracted products; arrest; investigation of offenses.
(*c*) Legal prosecution, competent courts; appeals; rights of transaction.

Chapter III. Penalties

(*a*) Punishment of single offenses.
(*b*) Punishment for repetition of offenses or of offenses with aggravating circumstances.
(*c*) Complicity in committing of offenses.

Commodity Report

Utilization of Small-sized Wood

An FAO/ECE special meeting on the utilization of small-sized wood, attended by more than 106 participants from 21 countries, was held at the Palais des Nations, Geneva, from 13 to 18 March 1961.

Problem of small-sized wood

The use of fuelwood is gradually declining in many European countries in the face of competition from coal, oil and gas. Since fuelwood is derived largely from small trees, coppice and lop and top, either new uses have to be found for surplus wood from these sources or else it is left standing or lying wasted in the forest. The amount of such wood, much of it hardwood, is very considerable. On the other hand, demand for industrial wood is increasing rapidly in nearly all countries, and the pulp and board industries in particular need to find new sources of raw materials from which to supplement their traditional supplies. The limiting factor to the greater industrial use of small-sized wood is no longer a purely technical, but an economic one. The high cost of harvesting and transporting it and its lower utilization value make it uncompetitive compared with other assortments of wood.

Background to the special meeting

In 1950, the problem of wood waste in the forest, especially of wood used in the past for fuelwood, was recognized by a working party of experts on the more rational utilization of wood. In 1959, recommendations were made by two subsidiary bodies of the ECE Timber Committee, the Consultation of Experts on Wood Utilization and the Joint FAO/ECE Committee on Forest Working Techniques and Training of Forest Workers (in collaboration with the International Labour Office [ILO]), that action should be taken to study the problem by convening a special meeting, the Joint Committee adding that the meeting should be under the chairmanship of Mr. Steinlin (Switzerland). The 17th session of the Timber Committee (E/ECE/TIM/63) endorsed these recommendations as did the 10th session of the European Forestry Commission.

Definition of small-sized wood

The following definition of small-sized wood was used as a basis for the papers and discussions at the special meeting:

> " those varieties of wood, broadleaved and coniferous, produced in forestry, which, because of their small dimensions, are suitable for a limited number of uses only and which therefore suffer from the competition of other assortments produced by the forest industry."

This definition deliberately excluded the waste from wood processing, included both coniferous and broadleaved species, and laid down no specific limit as to size, although, in effect, it included wood mostly less than 10 centimeters in diameter. Thus the definition of the term " small-sized wood " covers to a large extent undersized wood, which is wood generally considered too small for economic utilization. Small-sized or undersized wood, according to the above definition, occurs as coppice wood, thinnings from young stands, the lop and top from the felling of larger trees, and the clearings of brush and scrub.

Objectives of the special meeting

The aim of the special meeting was to bring together persons from various countries with expert knowledge of the harvesting and utilization of small-sized wood, to carry out an exchange of information about successful methods used at present, so as to promote the dissemination of practical solutions to harvesting and utilization problems. Additional aims were to help co-ordinate at the international level research into, and development of, processes and machinery for the felling, transporting and conversion of small-sized wood; and to give producers an idea of the present and future requirements of industrial and nonindustrial consumers for this class of wood; in brief, to collect and disseminate information and deas by the application of which both producers and consumers might make the utilization of small-sized wood economically feasible.

The meeting was conducted on the lines of a seminar; prepared papers were read on 14 selected topics, with open discussions following the reading of the papers on each topic. The topics were divided into three broad categories:

1. the nature and economic importance in six regions in Europe (including the U.S.S.R.) of the assortments occurring within the definition of small-sized wood;
2. information concerning present industrial uses and consumer requirements in the pulp, paper, fibreboard and particle board industries, for timber as a source of energy and for pitprops;
3. the greater efficiency of harvesting and transporting techniques resulting from improved working methods and mechanization as applied to wood derived

from four classes of forest stands producing small-sized wood — wood from coppice and coppice with standards, thinnings from young stands, lop and top from the felling of larger trees and older stands, and the clearings from brush and scrub.

At the end of the meeting three rapporteurs gave résumés of the important points arising out of the papers and discussions: one on the role of small-sized wood in the forest economies of European countries and its impact on national forest policies; one on the scope for the industrial utilization of small-sized wood; and one on trends in harvesting and transporting techniques. The chairman brought the meeting to a close with a statement indicating the main conclusions he drew from the meeting.

Conclusions

The assessment that follows has been made by the Secretariat. It is based on the opinions and conclusions expressed by the chairman at the end of the meeting, and also on those of the three rapporteurs, although the Secretariat has supplemented them with its own conclusions drawn from the meeting.

First, the dimensions of "small-sized wood," as defined for the purposes of the special meeting, cannot be accurately determined. Consequently, only very rough estimates of the volume of such wood potentially available can be made. It is estimated, however, that the total quantity of wood available in Europe, excluding the U.S.S.R., and falling within the definition of small-sized wood as used by the special meeting, is between 40 and 60 million cubic meters a year. This is wood which is at present being used either as fuelwood or not at all and which could be used for industrial purposes, but only if conditions arose in which its utilization became economic. On the other hand, consumption in Europe, excluding the U.S.S.R., of industrial wood raw materials, particularly by the pulp, paper and board industries, will continue to increase rapidly, and it is estimated that it will rise by about 60 million cubic meters between 1955 and 1970, or by more than 100 percent. As the chairman said in his summary: "Forecasts for wood consumption over the next 10 to 15 years anticipate a considerable rise in demand, particularly in those industries which could utilize small-sized wood, such as the pulp, paper and board industries. As it is in general impossible to increase fellings proportionately, it appears likely that the demand of the industries could only be satisfied if at least part of the small-sized wood used hitherto as fuelwood or not used at all were allocated to this purpose."

Secondly, there is no insurmountable physical or technical obstacle to the greater utilization of small-sized or undersized wood. The chief obstacle is, however, an economic one. In his summary the chairman pointed out that: "Despite the favorable outlook for the use of small-sized wood, the fact should not be overlooked that, from the economic point of view, this category will always be a marginal product, because its relative value is bound always to be lower than that of other categories, while production costs will always be higher. To this day, there is no end-use for which small-sized wood is more suitable than larger sizes. The consumer will always therefore give preference to larger sizes and resort to small-sized wood only when there is no alternative source of supply or if the price is considerably lower relative to other categories of wood."

Within certain limits, the utilization value per unit volume of wood is proportional to its diameter, while the production costs are inversely proportional to its diameter. Expressed graphically, the point at which the utilization value/diameter curve crosses the production cost/diameter curve indicates the economic marginal diameter at which wood can be produced and sold without incurring a loss. The chairman had the following to say in this connection concerning small-sized wood: "Its value is lower and its production costs higher than that of other categories produced under similar conditions. Due to the specific shapes of the value and the cost curves as a function of the wood diameter, even minor changes both in value and cost result in important shifts of the economic marginal diameter." To make the harvesting and utilization of undersized wood economically worthwhile, two possibilities exist: to reduce the costs of production and to increase its value to the consumer.

Reduction of production costs

As regards production costs, it was apparent at the special meeting that great attention is being paid in most countries to raising productivity of harvesting and transporting operations and to the substitution of labor by mechanization, in view of the faster upward movement of labor costs compared with costs of machinery. The chairman had the following to say on this point in his summary: "Rational transportation methods and the use of modern machinery and equipment *may* permit a further reduction in the production costs of small-sized wood. However, in the long run, the production cost ratio of small-sized wood to larger-sized wood may even be expected to shift against the former due to the fact that the share of human labor is bound to be greater (in producing the former) and also that in the future the cost of labor is expected to rise more rapidly than that of machinery."

Increasing value to the consumer

The other possibility, that of increasing the value of small-sized wood to the consumer by employing better industrial processing techniques, can be only indirectly influenced by the producers. Producers can help consumers to extend and increase their utilization of small-sized wood assortments by better organization of deliveries, for instance by arranging and carrying out long-term agreements for the delivery of these assort-

ments. The meeting made it clear that, of the various kinds of wood utilization, its use for wood distillation, power production, mining timber and fuelwood is declining; also that wood hydrolysis for the production of alcohol, sugar and plastics is not economic under present European conditions.

The best prospects lie with the pulp and paper, fibreboard and particle board industries, that is to say, those wood-consuming industries which have increased markedly in importance in recent years and which have the greatest interest in undertaking research with the object of broadening and increasing the utilization of small-sized wood. Promising steps have already been taken in some of the northern countries, where pulpwood down to 5 centimeters in diameter has been used in recent years. Of the problems to be solved in using wood of such small diameters, that of barking seems to be the most urgent.

Future action

The points emerging from the discussions at the special meeting that seem of importance for the formulation and implementation of national forest policies, are threefold.

Harvesting and transporting of small-sized wood

Steps should be taken to put into practice successful working techniques and equipment, and research intensified to improve existing techniques and machinery and develop new ones. In undertaking research, the following principles should be taken into account:

1. the necessity for reducing hand labor by simplifying working methods, by one-man work and mechanization;
2. the adaptation of the materials being harvested, as regards their shape, composition and the methods of sorting and grading them, to suit new time-saving techniques (e.g., using wood in longer lengths than the traditional ones, only roughly branching logs before chipping, etc.);
3. the carrying out of the various operations of harvesting, transporting and primary conversion using larger handling units, e.g., bundles of small-sized wood, rather than single pieces; alternatively the conversion of the raw material at the earliest possible stage into an homogeneous state (e.g., chips).

Marketing and utilization of "small-sized wood"

A lead should be given by encouraging and supporting producers and consumers to contract long-term agreements for the delivery and acceptance of supplies of small-sized wood at agreed prices. Before investing capital on research and on modifications to their equipment to make the utilization of raw materials other than the traditional ones possible, industrial consumers require, as a prerequisite, assurances regarding regular supplies of given specifications over a long period of time.

Silvicultural measures

The fact must be clearly faced that, as a source of industrial wood raw material, undersized or small-sized wood, as defined for the purpose of the special meeting, will always be in a weak competitive position, technically and economically, compared with the traditional assortments of industrial wood, such as pulpwood of established sizes and species. Once having accepted this fact, it is clear that implementation of points made in the two sections above would provide only a partial solution to the problem. The logical objective should be, therefore, to eliminate, as far as possible, the production of the smallest and lowest qualities of wood. A certain volume, in the form of early thinnings and of lop and top, is unavoidable, but by the adoption or modification of certain silvicultural practices, improvements to the structure and composition of many low-value forest stands could be achieved. The following possibilities are worthy of careful study:

Conversion of coppice. The attention and research already being applied in many countries to the conversion of coppice and coppice with standards should be intensified, including inquiry into the feasibility of growing a higher percentage of conifers in stands, where it is justifiable by site and biological factors. Priority should be given to the conversion, within the limits of the site factors, of those stands of the poorest sizes and qualities, for which there is little prospect of ever finding economic utilization in their present form.

Silvicultural measures in high forest. Greater consideration and research should be applied to those silvicultural methods aimed at producing a lower percentage of undersized wood from high forest. At the meeting the question was raised whether, in plantations, planting distances could be increased and thinning regimes adjusted to reduce the amount of undersized wood and of uneconomic work required in young stands, in the process of producing raw materials of the size and quality acceptable by industry.[1] In naturally regenerated stands, the early removal of surplus seedlings and undesirable species, as well as the application of modified cleaning and thinning regimes, could also be undertaken to achieve the same objectives.

---

[1] In evaluating the quality of raw material acceptable by the pulp and board industries, the shift toward somewhat less exacting requirements as to quality should be borne in mind; also the fact that these industries are taking a steadily increasing share of the total volume of forest removals. Consequently, silvicultural methods aimed at producing as low a volume as possible of the smallest sizes of wood, for instance, by wider planting distances and less early thinning, are more or less compatible with the less exacting requirements of the processing industries as regards defects such as knotty wood and high-percentage bark content. No general ruling could be applied, however, regarding the quality of wood that should be grown; each situation should be considered on its own merits.

The Work of FAO

European Forestry Commission

The FAO European Forestry Commission held its eleventh session in Rome from 22 to 26 May 1961.[1] A field trip was organized from 27 to 29 May by the Italian Forest Service to inspect watershed management, torrent control and afforestation works in the Calabrian Apennines, and also silvicultural and logging operations in the *Pinus laricio* forests.

The session was presided over by the Commission's chairman, J. Jungo, Inspector-General of Forests of Switzerland. Two rapporteurs were appointed, J. Q. Williamson (United Kingdom) and J. de Vaissière (France).

Review of national progress reports

The progress reports presented by the member countries constituted an excellent summary of the state of forestry in Europe in 1960. The main features and trends are summarized in the Commission's report.

One significant trend is the development of industries capable of utilizing small-sized logs and waste. Most countries reported the recent or imminent opening of fibreboard or particle board mills. Meanwhile, pulp and paper mills, also increasing in number, are using wood of smaller dimensions and larger quantities of hardwoods. Between 1958 and 1960, the output of fibre board in Western Germany increased by 30 percent, and particle board by 74 percent. In Switzerland, the output of particle board increased by 50 percent, half of the raw material being waste from sawmills. A new pulp mill has been experimenting with the use of wood of all species with diameters as small as 6 centimeters. Hardwoods, pines and sawmill waste provided 36 percent of the raw material used by the pulp and paper industry. In Denmark, the packing industry has been equipped to utilize beech logs with diameters down to 10 centimeters, and the chemical pulp industry utilizing beech is expanding. In Finland, the pulp industry is using barked spruce with a diameter as small as 5 to 8 centimeters, and in Sweden the limit is even lower, 4 to 7 centimeters. In France, consumption of hardwoods by the paper industry was 142,000 cubic meters in 1939 and more than 1 million cubic meters in 1960. In Northern Ireland, a chipboard mill has been into put operation and the establishment of a woodwool factory is contemplated. In Poland, in 1959 and 1960, sawmill waste accounted for 40 percent and 54 percent respectively of the raw material supply for the pulp mills while, in 1959, the board industry absorbed 40,000 cubic meters of small-sized timber. In Sweden again, where pulp and paper production is expected to rise from 5.2 million tons in 1958 to 6.7 million tons in 1963, and where two new sulphate pulp mills came into operation in 1960, the consumption of hardwoods for pulp has doubled in five years.

The fall in demand for fuelwood might be checked by a more widespread use of methods for preparing wood in chip form for utilization in central-heating boilers — methods devised in the Scandinavian countries and which Switzerland has been trying to perfect.

The increase in consumption of hardwoods for pulp — particularly as the use of hardwoods in mixture is still at the trial stage — is not likely to deter countries from conversion of coppice stands to high forest and especially from interplanting with softwoods. The predominant impression gained from all reports is that the requirements of industries now exercise a determining influence on forest management.

The Commission noted with satisfaction that progress in forest extension (344,000 hectares), new plantations outside the forest (47,000 hectares), and forest rehabilitation (242,000 hectares) reported by member countries for 1959 was the largest ever recorded. The increase in new plantations outside forest reserves is particularly striking: barring serious changes in the European economic situation, it can reasonably be expected that progress over the next few years would be in the order of 300-350,000 hectares annually for forest expansion, 50-60,000 hectares of new plantations outside the forest, and 250-300,000 hectares for forest rehabilitation.

One obstacle to this general development, and perhaps the most disturbing, may be scarcity of labor, as the areas where the vast proportion of natural forests are situated are precisely those which tend to become depopulated. The Commission discussed and suggested a number of possible remedies.

The question remains open as to whether the magnitude of the effort being made by forest producers is commensurate with the increase in wood needs anticipated in Europe. Also, will the investment needed to intensify this effort enable the raw material to be produced at prices that will compete successfully with substitute raw materials which are also being developed with great rapidity?

These are points which, in the opinion of the Commis-

[1] The session was attended by 50 delegates from 21 member countries: Austria, Belgium, Cyprus, Denmark, Finland, France, W. Germany, Greece, Ireland, Israel, Italy, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and Yugoslavia. Observers were also present from the United Nations Economic Commission for Europe, the International Labour Organisation, the European Economic Community, the International Union of Forest Research Organizations, and the European Confederation of Agriculture.

sion, can only be answered by a thorough reassessment, covering the whole continent, of the trends in wood production, consumption and trade. FAO has, in point of fact, already embarked on such a reappraisal in collaboration with the Economic Commission for Europe, and simultaneously is carrying out a special study of the pulp and paper sector, financed by funds subscribed by pulp and paper associations of a number of countries inside and outside Europe.

Impact of economic integration schemes on Europe's forestry

Other topics covered by the Commission's discussions were progress in research on forest tree improvement, the use of fertilizers to stimulate forest production, pests and diseases, and game control and management. Forestry funds was another major topic which is dealt with separately in this issue.

The Commission was informed by the observer from the European Economic Community (EEC) on the nature of its common forest policy as applicable to forests, but not to forest products: the latter are subject to the rules established for those products in Appendix I to the Treaty of Rome. The Commission also heard a statement from Mr. du Vignaux, Directeur général des eaux et forêts, France, speaking on behalf of the delegations of the member countries of the European Economic Community, to the effect that a common forest policy, which ought to be conceived within the framework of a common agricultural policy, was still being formulated. In order to arrive at a common forest policy, the members of EEC had decided to examine first a certain number of specific questions which, through the establishment of rules within EEC, might lead to modifications in the laws and regulations of its Member Nations. This was outside the competence of FAO but the European Forestry Commission would be kept informed of developments. A spokesman for the European Free Trade Association (EFTA) made the same point.

Owing to the deficit in wood within the present structure of EEC and the expected expansion of requirements, a common forest policy would be based on dynamic principles aiming at increased production and the lowering of costs. It did not seem likely that a reduction of imports would result for EEC as a whole, due to the liberality of the common external customs tariff and widening of its membership.

Country planning and problems of small farms

In the context of co-operation between FAO's European Commission on Agriculture and the European Forestry Commission, the Commission heard statements by several delegations on the problems of country planning and small farms. It seems that rural exodus and urbanization were, despite the effect on manpower, opening up new possibilities for forestry. In the hinterlands now being abandoned the forest must come to occupy an important place again, to provide wood, employment and income to the remaining small farmer, to serve soil and water conservation, and to furnish recreation areas. In the vicinity of towns, the rising standard of living and the aspirations of the new generation were stimulating the creation of green belts for recreation and leisure. All these new land-use trends afford increased opportunities of co-operation between foresters and agriculturists.

The results were examined of an FAO survey entitled *The administration of public and common grazing lands in Europe, 1961.* In a number of European countries, the forest administration has either sole or joint responsibility for the administration of public and common lands. In addition, no less than 60 million hectares of European forests, out of a total of about 150 million, are publicly owned — either state or communal forests — and a substantial part of them are periodically grazed. Under these circumstances, foresters are bound to take a keen interest in the topic, but the Commission felt that great difficulties were involved in reaching general conclusions valid for the whole European region. There is, in fact, hardly any other type of land-use more closely circumscribed by local factors. Nevertheless, it agreed to participate in any further regional studies or developments in this field.

Procedural matters

The Commission reviewed the activities of its subsidiary bodies [1] and laid down directives for further work. It proposed that the existing Working Party on Afforestation and Reforestation and the Working Party on Afforestation Techniques of the Mediterranean Forestry Subcommission be amalgamated into a body to be entitled Working Party on Techniques of Forest Extension and Restoration, which should be a joint subsidiary body of the European, Near East, and African Forestry Commissions.

It further decided to set up a Working Party on Chestnut if the full FAO Conference came to the conclusion that the existing FAO International Chestnut Commission should be abolished.

The session closed after the Commission had examined trends in FAO's program of work and its technical assistance activities as affecting the European region. Before the delegates dispersed, they unanimously elected. Mr. Wilhelm N. Plym Forshel, of the Swedish National Board of Private Forestry, as chairman until the end of the Commission's twelfth session (1962). Messrs. Otto Eckmuller (Austria), Nicholas Metaxas (Greece) and Adrianus Stoffels (Netherlands) were unanimously elected vice-chairmen for the same term of office.

---

[1] Mediterranean Forestry Subcommission
FAO/ECE Committee on Forest Working Techniques and Training of Forest Workers
Working Party on Torrent Control and Protection from Avalanches
FAO/ECE Working Party on Forestry and Forest Products Statistics
Silvicultural study tours

Study Tour in France and the United Kingdom

After the special meeting, on the utilization of small-sized wood (*see* Commodity Report), there followed from 20 to 24 March a study tour in France and the United Kingdom concerned primarily with aspects of the harvesting and the industrial utilization of small-sized wood.

In France, participants visited a pulp and paper mill at Alizay, near Rouen, operated by the Société industrielle de cellulose Alizay (SICA). This mill produces bleached sulphite pulp from 100 percent hardwoods, mostly beech but also hornbeam. Most of the pulp is for the artificial textile industry (fibranne and cellophane), while the remainder is used for specialized paper-making. Participants also visited the Beghin pulp and paper mill at Corbehem (Pas-de-Calais), where newsprint (about 30 percent of the total production in France) and cardboard from imported and home-grown softwoods are produced. The company is also investigating the possibilities of using hardwoods as a raw material for newsprint.

Numerous types of machinery for harvesting and transporting wood, including coppice and other small-sized wood, were demonstrated in prototype or commercially-operating form. The Centre technique du bois showed prototype machines for harvesting coppice, for clearing scrub and for ground preparation, and other machinery for the cutting, skidding and the primary conversion of undersized wood. An exhibition of forest machinery was also organized.

In the United Kingdom, participants visited the Kemsley mill of the Bowater Company at Sittingborne, where newsprint is produced from a mixture of mechanical pulp imported in bales and crushed-wood sludge made from imported timber. The mill also produces corrugated cardboard, part of the raw material of which is from homegrown hardwoods treated by the neutral sodium sulphite process; fibreboard is also produced there by the "defibrator" process. Participants also visited the Sudbrook pulp mill, where "Gatecel" wood pulp is produced from home-grown hardwoods by the neutral sulphite process.

Silviculture on Farm Forests

The third silviculture study tour organized for members of the European Forestry Commission was held in Austria from 5 to 15 June. It was devoted to the subject of silvicultural measures applicable to farm forests. Some 20 foresters from 10 countries saw in the field the work being done by the Chamber of Agriculture and Forestry on farm forests in Styria, and they compared methods seen with those used in their own countries.

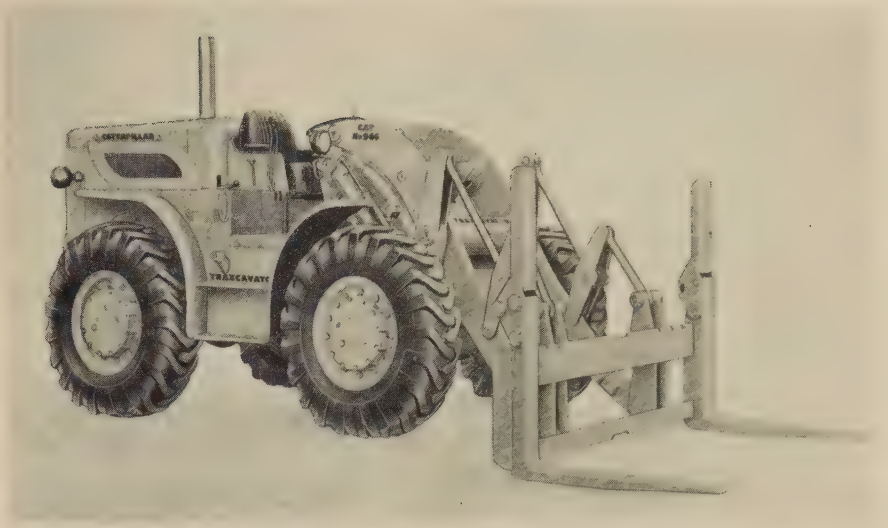
The well-established concept of the farm, its fields and woodlands as one entity, provides the congenial basis in Styria for close team work between the forestry adviser, the farm adviser, and the home economics adviser in working with the farmer, his wife, and children. With some state financial assistance for access road programs and training school programs an intensive improvement has been made possible in crop production, cattle raising and pasture development and, along with these, sound silvicultural practices in farm woodlands. The methods used made a deep impression on the visiting foresters.

This third study tour is to be followed by the fourth in the series in the Netherlands in 1962, on the subject of plantation thinning methods.

Equipment Section

Smokechaser Outfit (Fedco.) — Collapsible or inflatable type backpack water container. Capacity 5-6 gal. (19-23 lit.). Dry weight 4 ½ lb. (2 kg.). Bag neoprene (coated nylon fabric). May be stored indefinitely. Minor damage can be repaired with any standard tire tube patch outfit.

MANUFACTURER: *Fire Equipment Development Co., 829 Estabrook Street, San Leandro, California, U.S.A.*



Lumber Fork. — Designed for Caterpillar's 966 wheel type traxcavator, the lumber fork has tines with a flat profile to handle lumber, sawlogs, pulpwood and palletized materials.

Loads up to 9,200 lb. (4,200 kg.) safely handled at maneuvring speeds. Counterweighting increases safe maneuvrable load to 12,700 lb. (5,800 kg.). Hydraulic system capable of lifting a 16,600 lb. (7,570 kg.) load at the center of the tire to full height with fork level.

The 3 × 6 × 48 in. (8 × 16 × 122 cm.) tines may be adjusted to spacing of 45, 60, 75 or 88 in. (115, 153, 190, 224 cm.). Standards are 70 in. (178 cm.) in height. Approx. weight of attachment 2,180 lb. (990 kg.).

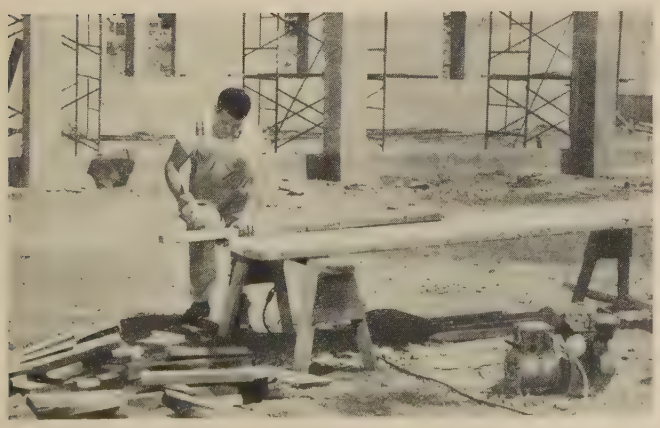
MANUFACTURER: *Caterpillar Tractor Company, Peoria, Illinois, U.S.A.*

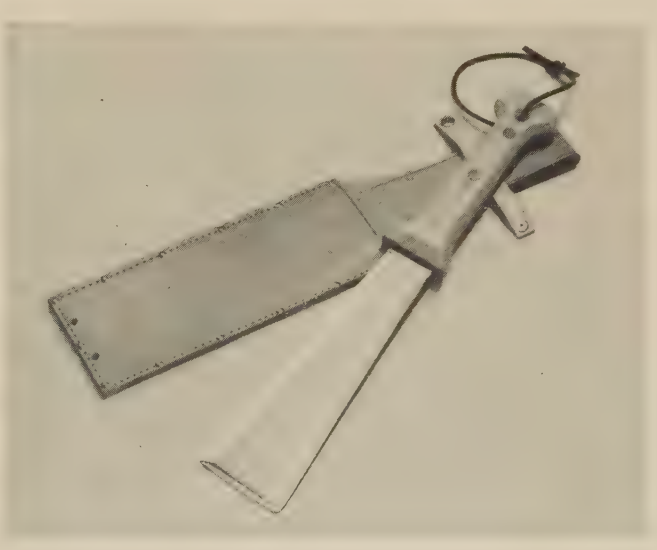
Homelite Lightweight Pump and Generator. — Homelite lightweight pump and generator driven by 4-cycle engine delivers 1500 watts of 115 volt A. C. power. Weighs only 104 lb. (47 kg.). Is available for operation with gasoline or LP gas.

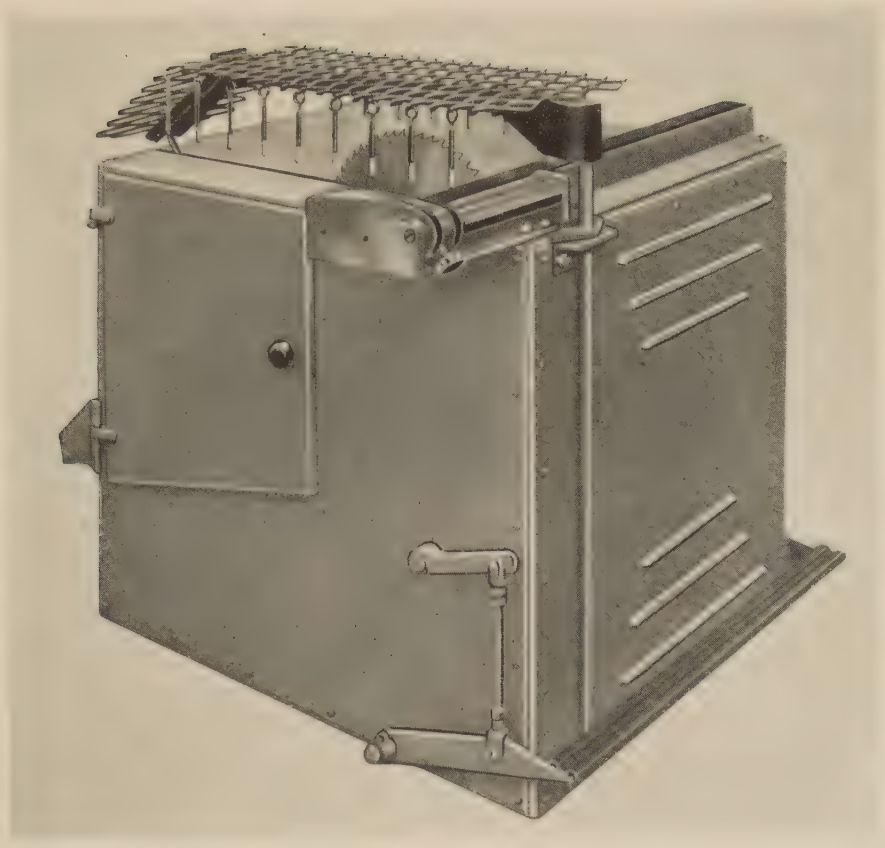
MANUFACTURER: *Homelite, 70 Riverdale Avenue, Port Chester, New York, U.S.A.*

Stecher Haxit. — Blade length 9 in. (22 cm.); width maximum 2 ¾ in. (7 cm.); weight 22 oz. (625 g.); chops through 4 in. (10 cm.) diameter branch; drives in nails; staples or fences posts; digs up plants and cuts sods for transplanting.

MANUFACTURER: *Needham, Veall and Tyzack Ltd., Eye Witness Works, Milton Street, Sheffield, England.*

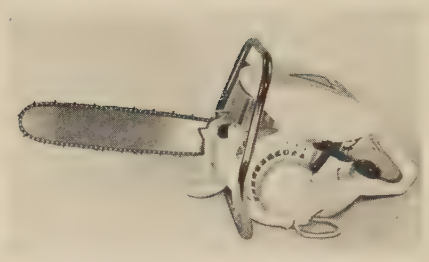






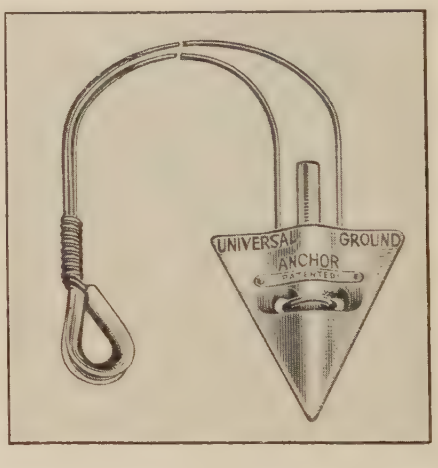
Crosscut Saw with Retractable blade. — Circular saw in which blade retracts under saw table, thus providing optimum clearance and easy approach from all sides. Slight pressure of the foot on pedal puts hydraulic feed mechanism in motion. Machine can be fitted with extension tables in lengths of multiples of 1 m. with rollers mounted on ball bearings. With the 2-m. long device graduated in mm., wood can be cut into different lengths.

MANUFACTURER: *Ateliers Smid, Case Postale 332, Mulhouse, France.*



Pioneer Model 610 — Engine develops 6 hp and the unit can be equipped with cutting attachments from 16 to 32 in. (40-81 cm.). Diaphragm carburator enables machine to cut in any position. Most of the casting is die cast aluminum and weldable if necessary. Total weight less attachments is 20 lb. (9 kg.).

MANUFACTURER: *Pioneer Saws Ltd., Peterborough, Ont., Canada.*



Jiffy Lift. — Loads and unloads in few minutes. Load is lifted from any level or unlevel surface. Four wheel drive moves load forward to exactly where wanted. Can be operated by one man with only two levers. Completely self-powered by a 9 hp gasoline engine. Lifting capacity 10,000 lb. (4,500 kg.). Manufactured in 4 models.

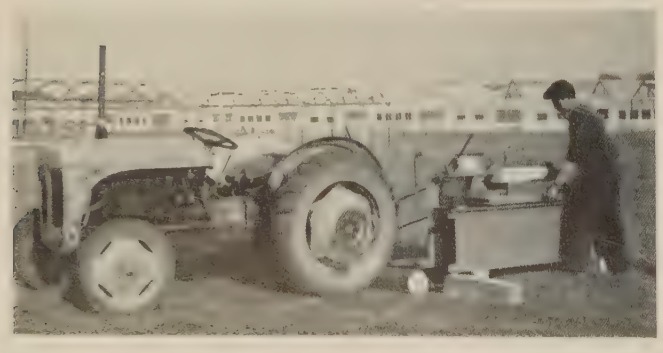
MANUFACTURER: *Wayne Exports Inc., Richmond, Indiana, U.S.A.*

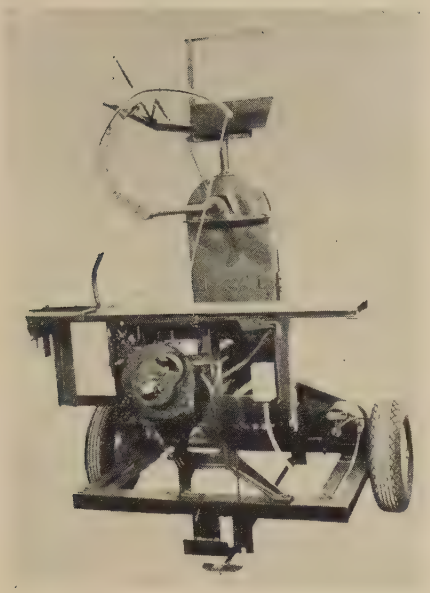
Universal Ground Anchor. — The anchor is extremely simple to operate and in the various sizes can be used to hold down practically any object under almost every condition. Manufactured in five sizes from 2 in. to 8 in. (5-20 cm.).

MANUFACTURER: *Bartlett Manufacturing Company, 3003, East Grand Boulevard, Detroit 2, Michigan, U.S.A.*

Roncar Appliance. — Devised to speed production of squared timber, either from round or quartered pieces. Particularly suitable for pitwood square production. Appliance fastened to sawbench table of type which moves in relation to saw. Cuts square or octagonal shapes and with addition of extra back plates, hexagonal and other shapes. Wood held in lathe-like attachment, which runs along slides to bring it in contact with stationary saw. Wood is rotated to give different cutting angles.

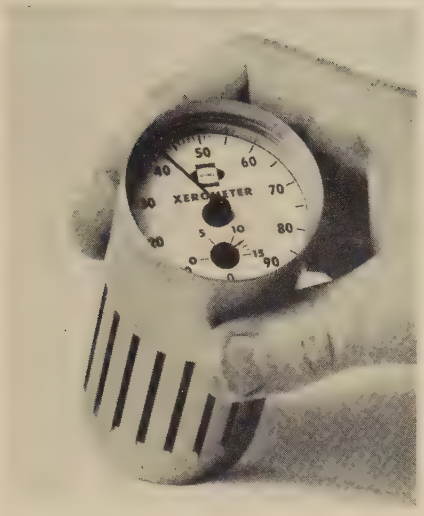
MANUFACTURER: *R. W. Carr, Wigginton, Yorks, England.*





" Saxmayer " Model SRN Shrub and Tree Bundler. — Ties shrubs, trees, flowers with equal ease. Simple to operate: place bundle in tying position; step on the trip, bundle automatically compressed and tied with one wrap and a non-slip bow knot. Automatically adjusts to tie bundles from 2 to 10 ½ in. (5-26 cm.) diam. and up to 7 ft. (2.10 m.) long. Automatic safety release protects machine and operator. Weighs about 450 lb. (200 kg.) Uses sisal, cotton or jute twine. Electric motor or gasoline engine. Max. speed 30 ties/min. Over-all dimensions 39 in. (19 m.) long × 40 in. (102 cm.) wide × 72 in. (183 cm.) high.

MANUFACTURER: *National Bundle Tyer Company, Blissfield, Michigan, U.S.A.*



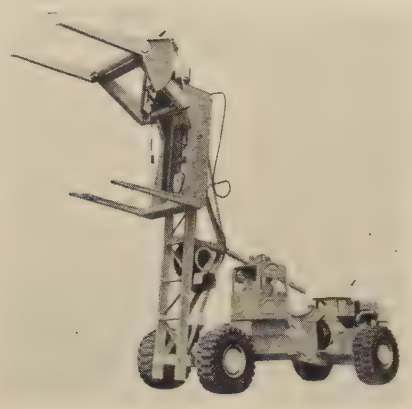
Xerometer. — Indicates relative moisture content of gases (air, carbon dioxide, oxygen and many others), liquids (alcohol, acetone, gasoline and petroleum products, etc.), and solids (wood, soil, grain, chemicals).

A reliable guide to fire danger due to fuel dryness. As a soil moisture probe the Xerometer reports precise values between saturation and "wilting point." In air gives index of relative humidity.

MANUFACTURER: *ADVINCO, 700 South 4th Street, Richmond, California, U.S.A.*

Bongioanni Horizontal Bandsaws Models STO/1 - STO/2. — Differ from other types of horizontal log bandsaws, as besides normal sawing they can be equipped with circular saws for vertical cutting. An electro-mechanical or electro-magnetic divisor can be installed. Up to nine circular saws can be mounted for cutting vertically.

MANUFACTURER: *Fonderie Officine Meccaniche Bongioanni, Fossano, Italy.*

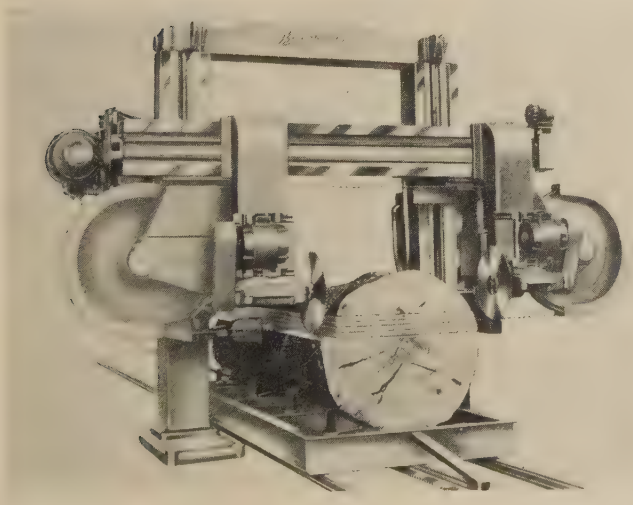


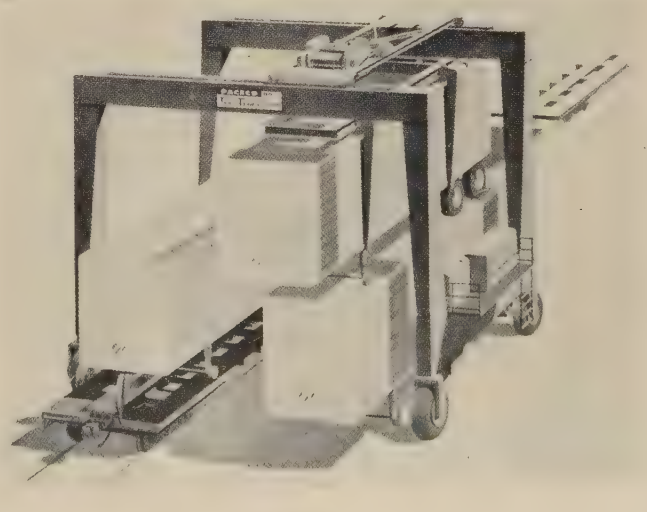
Log Stacker. — Twenty-five ton lift capacity, electrically controlled. Over-all length (incl. forks) 43 ft. 7 in. (13 m.); fork length 10 ft. (3 m.); over-all width 12 ft. (3.6 m.); over-all height 29 ft. 5 in. (8.8 m.); wheelbase 23 ft. (6.9 m.). Turning radius approx. 26 ft. (7.8 m.); speed up to 11 m.p.h.; elevation of forks max. 20 ft. (6 m.); weight approx. 79,000 lb. (35,800 kg.).

MANUFACTURER: *R. G. LeTourneau Inc., Longview, Texas, U.S.A.*

Paceco Transtainer. — Transfers container or any load from railcars to chassis or ground in two minutes. Can move down a train, load and unload as it goes. Electrically driven, controlled by crane operator, designed for ease of shipping. Unit breaks down into 8 individually complete sections. Two men can assemble or disassemble in 4 hours. *Specifications*: capacity 25 to 30 tons; lift 19 to 23 ft. (6-7 m.); wheel base 18 ft. (5.40 m.). Minimum radius of turn centerline to outside wheel 43 ft. 6 in. (13 m.) radius.

MANUFACTURER: *Pacific Coast Engineering Co., Alameda, California, U.S.A.*





News of the World

Australia

• A book to appear recently is *The Eucalypts: botany, cultivation, chemistry and utilization* by A. R. Penfold, former Director of the Museum of Applied Arts and Sciences, Sydney, and J. L. Willis, the present Director, and published by Leonard Hill (Books) Limited, London, and Interscience Publishers, Inc., New York, pp. xx + 467. Issued in the World Crops series and thus emphasizing the important place in agriculture occupied by trees in this day and age, the book has, in addition to the 28 figures, 5 maps and 6 plates, a comprehensive bibliography, a subject index and an author index. All aspects of the eucalypts receive full treatment — biology, technology, anatomy, the classification of species varieties, and the utilization of products. The chapters on actual eucalyptus growing in countries where this species has been introduced from its native Australia are relatively less full in their treatment, a gap which may be filled from the information forthcoming on the occasion of the FAO Conference on eucalypts held in Brazil in August 1961.

Canada

• The Department of Forestry has in the past few years increased the number of French editions of its publications, so that at the present time there is a fairly comprehensive selection available. These can be made available to agencies in other countries, insofar as the supply permits. The list of titles may be obtained from the Department of Forestry, Ottawa.

China, Mainland

• *The forests of China* by Wang Chi-Wu is the latest (No. 5) in the series of Maria Moors Cabot Foundation Publications (Botanical Museum, Harvard University, Cambridge 38, Mass., U.S.A. - Price $ 3.00). The book represents the fulfilment of many years of study and thousands of miles of travel in little-known regions, and the writer has also made a valuable integration of the previous studies of a large number of different authors. No other first-hand report on the forests of continental China is likely to be available in English for some time.

Cyprus

• Cyprus became an independent republic in August 1960 but the existing forest policy and legislation remained unaltered. Ever since the establishment of the Forest Department in 1878, the Government has aimed at achieving certain definite objectives in managing the Cyprus forests. A formal declaration of forest policy was promulgated in 1950 when it was considered that the general public was ready to accept such a policy.

Reporting to the last session of the European Forestry Commission, the delegate of Cyprus explained that the Forest Department formed part of the Ministry of Agriculture and Natural Resources. The internal organization of the department was set up into three territorial divisions, and five specialist divisions: management, research, utilization, education and engineering.

The minor state forests were recently surveyed and classified into a number of categories, depending on their proposed future use and they are still under the administration of district officers (previously called commissioners). The future status of these minor state forests will undoubedly form the subject of discussion and decision by the Government.

The extension service of the Forest Department encourages the planting of forest trees and it gives advice both for planting, tending and management of private woodlands free of charge. In some cases, the Department prepares simple working plans or plans of operation for private woodland owners. Legislation controls the felling of trees which are privately owned and provides for a licensing system whereby applications for tree felling are examined by the Forest Department and licences for tree cutting are issued in accordance with the silvicultural requirements of the private plantation or forest under examination.

There is the closest co-operation between the agricultural and forest services and a combined effort is being made during Tree Planting Week to encourage private tree planting. No specific training courses are provided for private woodland owners but the Cyprus Forestry Association organizes tours for its members to the state forests where forestry operations are examined and discussed. The encouragement of private forestry through direct state subsidies is under consideration, as also the possibility of introducing a dedication scheme on the lines of that in force in the United Kingdom.

Denmark

• The general motorization which has been developing during the last decade is now exercising a marked influence upon forest administration. First, motor transport has become usual not only for forest officers but also for rangers (and workers), enabling them to reach remote forests in a short time. Secondly, the introduction of power saws and other mechanized equipment has considerably reduced the number of workers employed, especially in broadleaved forests where, moreover, there is a tendency toward using full-tree logging methods and a distinct decline in local sales.

All this means that rangers, and in some cases also forest officers, can cover much larger administrative units, and a committee has been set up in the State Forests Department to consider these problems. It will probably recommend a gradual reduction of about 10 percent of personnel of district staffs.

France

• *La conservation du matériau bois* by Henri Mathieu, Ingénieur forestier D.P.E. (J. B. Baillière et Fils Editeurs, 19 rue Hautefeuille, Paris 6e, France) is a reference manual which should be of widespread interest to all those promoting the use of wood in housing and construction. It contains a full section on processes, equipment and manufacturers.

Germany, Western

• From 28 May to 8 July a seminar on forestry in tropical countries was held in Berlin, organized by the German Foundation for Developing

Countries (Deutsche Stiftung für Entwicklungsländer) in co-operation with FAO.

This highly successful seminar was the first to deal with forest development and planning in a series organized by the Foundation, which has been in operation for a year. It was attended by 29 senior foresters from Burma, Federation of Malaya, Ghana, India, Indonesia, Liberia, Nepal, Nigeria, Pakistan, the Philippines, the Sudan and Thailand. Professor Weck, Director of the Federal Forest Research Institute, Reinbek bei Hamburg, was in charge. G. R. Gregory of FAO was co-director, and his particular subject was forest economics in guiding forest policy and developing industries. Egon Glesinger, Director of the Forestry and Forest Products Division of FAO, gave the introductory lectures and three other members of the FAO staff assisted for short periods.

After the initial period of discussions at the Foundation center in the Villa Borsig, the participants dispersed on a three-week field tour in Western Germany, concluding with an " evaluation week " at Hanover.

India

• A leading U.S.A. pulp and paper company has signed an agreement with an Indian company to provide technical assistance and patent rights for the production of newsprint from bagasse. The proposed plant, for which the Government has already granted an industrial licence, will have an annual capacity of 60,000 tons of newsprint. The cost is reckoned at approximately U.S.$20 million.

The new process, which has been developed in collaboration with the Hawaiian Sugar Planters' Association, is stated to represent a technological advance over existing methods for refining and pulping bagasse. The pulp itself has been manufactured in industrial-size digesters, converted into newsprint on standard newsprint machines without technical adaptations, and the finished paper has been run on modern high speed rotary presses. Its mechanical and printability performance was of commercial quality and no adjustment to the presses was required.

The attributes of quality newsprint are smooth surface, good opacity and good ink absorbency. With wood as the fibrous raw material these characteristics are obtained by grinding the wood against a stone or by the recent technique of treating wood chips in a disk refiner. It is apparently the latter method that has been successfully adapted for bagasse. The furnish is a mixture of chemical and mechanically-refined bagasse pulps.

Turkey

• Of interest in view of the United Nations Special Fund project for the integrated development of the Antalya region, is that a southern forest research station under the Central Forest Research Institute was established in Antalya in 1958. Experiments started on two research forests and several experimental areas were established.

The main forestry problems of the Mediterranean region of Turkey are:

1. forest fires;
2. forest grazing;
3. reforestation - selection of species to be used, seed, nursery and planting techniques;
4. afforestation - plantations of fast-growing species (e.g., eucalyptus) and economically valuable species (e.g., cork oak), stabilizing and planting sand dunes; establishment of windbreaks;
5. watershed management and improvement; flood control; soil erosion control;
6. forest management practices;
7. accessory products (e.g., resin, cork, storax, etc.);
8. tree exploitation improvement studies of important species of the region.

Most of these problems are of common concern to all countries of the Mediterranean area, and the FAO Mediterranean Forestry Subcommission is attempting to work out a co-ordinated program of research, in collaboration with the International Union of Forest Research Organizations.

Union of Soviet Socialist Republics

• An edition in Russian, edited by P. V. Vassiliev and P. B. Vipper, has been issued of *World geography of forest resources*, originally prepared and published by the American Geographic Society, and earlier reviewed in *Unasylva*. Translation into Russian slightly condenses the original text.

Material on forest resources in socialist countries has not been included in the translation on account of the availability of more recent and exhaustive data in Soviet literature. However, the introduction includes a rather comprehensive statement on basic economic data of forest and forest industry in these countries. The final part brings out various conclusions reached in different parts of the book, and incorporates the editors' views on the future of forests and forestry.

There is an index of more than 1,500 names (in Latin and Russian) of species mentioned in the book, and an addendum to the original text gives a world statistical compilation based on recent FAO publications.

United Kingdom

• There has been a considerable extension of the application of work study to logging operations by the Forestry Commission and it is reported that the following advances have been made:

1. substantial improvements in felling and logging tools used and their maintenance; and an increase in the use of power saws;
2. a number of devices to minimize heavy lifting and heaving have been introduced; notably long-handled tongs for pulling down thinnings and a horse-drawn sledge based on a Swedish design;
3. an increase in the use of loading devices, notably hoists for loading logs, poles and pulp lengths;
4. introduction of the first regional piece-rate schemes based on time studies of sound working methods.

In mechanization, an entirely new system is on trial for the haulage of long logs by standard wheeled tractor, without using a timber arch or other supplementary vehicle. The object is to raise the butt ends of a trailed load of logs (so that the butts are clear of the ground) and to carry the load at a point forward of the rear axle of the tractor with the tips of the logs trailing on the ground. The load is thus carried on the driving wheels (where it assists wheel grip) instead of being carried on a dead axle (as is the case with a timber arch). Moreover, the tractor is easier to handle on the return journey as it does not have to trail an empty arch. A feature of the device is its ability to lift the load off the ground through the geometry of the hitch arrangement, so dispensing with the need for a tractor winch. The cost is substantially less than that of a timber arch.

United States of America

• Research to determine how forests can be used to increase water supplies is to be conducted at Duke University, Durham, North Carolina, over a

five-year period with the assistance of $ 100,000 grant from the Rockefeller Foundation. Members of the School of Forestry will undertake fundamental research to determine how the maximum supply can be obtained from ground water sources fed by watersheds through the use of forests as cover crops that collect and hold water.

In the humid eastern United States, urban building and highway construction have substantially affected ground water supplies, and the practice of impounding excess stream water in reservoirs, feasible only to the extent that the rights of landowners downs tream are not infringed, has proved inadequate to the expansion of urban and industrial development and the intensification of agricultural production. The results of the research should have widespread application to hilly forested lands in the less well-developed agricultural regions of the world.

• Seven men of international repute in forestry and conservation were awarded 50th Anniversary Distinguished Service Medals during the golden anniversary celebrations in April 1961 of the State University College of Forestry, Syracuse University, New York. They included **Frank H. Kaufert,** Director, School of Forestry, University of Minnesota and **Conrad L. Wirth,** Director, National Park Service. The other five men have been closely associated with FAO. **Richard E. McArdle,** Chief of the U.S. Forest Service, was given the award "for inspiring administration in public forestry," and **Eino Saari,** Professor of Forest Economics, University of Helsinki, "for devoted service to world forestry," **I. T. Haig,** who received the medal "for creative leadership in national and world forest science," was on the staff of the Forestry and Forest Products Division of FAO from 1951 to 1958. During the next two years, he was executive secretary of the organizing committee and later, Secretary-General for the Fifth World Forestry Congress. Recently, he has been appointed Carnegie visiting professor of forestry at the University of Hawaii for 1962/63.

George A. Hunt, who received the award "for inspiring guidance in forest products research," was formerly Director of the United States Forest Products Laboratory; since 1954, under the FAO technical assistance program, he has been special adviser to the Philippines Forest Products Research Institute and, on completion of his assignment recently, became the first American scientist to receive the Outstanding Achievement Award of the [Philippines] National Research Council for his studies on forest products utilization and for distinguished service in the establishment and development of the Institute.

Herman F. Mark, Director, Polymer Research Institute, Polytechnic Institute of Brooklyn, New York, is Chairman of the FAO Panel on Wood Chemistry. He holds positions of leadership in world-wide scientific groups, and has received many international honors. His award was "for penetrating discoveries in polymer chemistry."

• Books lately received include the following:

1. Brauns, F. E. and Brauns, D. A. *The chemistry of lignin,* Supplement Volume, Academic Press, New York and London, 1960, 804 p., $18.00, a critical review of the literature published from 1949 through 1958.

2. Ise, John. *Our national park policy,* Resources for the Future Inc., Johns Hopkins Press, Baltimore, Md., vii + 701 p., $ 10, which will be particularly well received now at a time when the social values of the forest are being increasingly recognized.

3. MacDermid, W. (ed.). *The use of chemicals in southern forests,* Louisiana State University Press, Baton Rouge, La., contains the proceedings of the ninth annual forestry symposium.

4. Rasmussen, Edmund. *Dry kiln operator's manual,* U.S. Department of Agriculture, Forest Service, Washington, which will be of most direct usefulness to owners.

5. Anderson, Roger F. *Forest shade tree entomology,* John Wiley and Sons, New York and London, 1960, 428 p., ill., $ 8.50, intended both as textbook and reference manual.

6. Cooke, Giles B. *Cork and the cork tree* (Volume 4, Botany, International Series of Monographs on Pure and Applied Biology), Pergamon Press, Oxford, England, 1961, 50s., which provides a single source for all important general information about cork oak and its products.

Two paperbound reprints issued by Dover Publications Inc., New York, are:

1. Frost, S.W. *Insect life and insect natural history,* 526 p., ill., $2.25, a revised edition of the author's *General entomology* which appeared in 1942, and

2. Pearsons, Frances T. *How to know the ferns,* xiv + 215 p., $ 1.25.

Economics studies and statistics	$	£
YEARBOOK OF FOREST PRODUCTS STATISTICS 1960 (Tri.)	2.50	12s. 6d.
TIMBER TRENDS AND PROSPECTS IN THE ASIA-PACIFIC REGION (In preparation in E. and F.)		
WORLD DEMAND FOR PAPER TO 1975 1960 (E.)	1.50	7s. 6d.
WORLD FOREST INVENTORY 1958 1960 (Tri.)	2.50	12s. 6d.
ASIA-PACIFIC GRADING RULES Standard nomenclature of the exportable timbers of the Asia-Pacific Region 1960 (E.)	1.00	5s.
REPORT OF THE FAR EAST PULP AND PAPER CONFERENCE (In preparation in E. and F.)		
FAO MEDITERRANEAN DEVELOPMENT PROJECT 1959 (E., F. and S.)	2.00	10s.
Technical studies		
PINUS RADIATA (In preparation in E., F. and S.)		
Development papers		
CHOICE OF TREE SPECIES (E., F. and S.)	3.50	17s. 6d.
PRACTICAS DE PLANTACIÓN FORESTAL EN AMERICA LATINA 1960 (S.)	5.00	25s.
FOREST INFLUENCES (In preparation in E., F. and S.)		
THE GENETICS OF FOREST TREE IMPROVEMENT (In preparation in E., F. and S.)		
Occasional papers		
FUELWOOD IN JAPAN (No. 9) 1960 (E.)	Free on request	Free on request
WORLD LIST OF PERIODICALS AND SERIALS OF INTEREST TO FORESTRY (No. 10) 1960 (Tri.)	,, ,, ,,	,, ,, ,,
Directories		
FOREST SEED DIRECTORY 1961 (In preparation, Tri.)		
DIRECTORY OF FOREST RESEARCH INSTITUTES (In preparation)		
DIRECTORY OF FORK LIFT TRUCKS AND STRADDLE CARRIERS 1960 (Bilingual E/F)	Free on request	Free on request
CATALOGUE OF TREE-PLANTING MACHINES Forestry Equipment Note A. Cat. 1, 1960 (Bilingual E/F)	,, ,, ,,	,, ,, ,,
CATALOGUE OF DEBARKING MACHINES Forestry Equipment Note D. Cat. 3, 1960 (Bilingual E/F)	,, ,, ,,	,, ,, ,,
WORLD DIRECTORY OF FORESTRY SCHOOLS Published by the Society of American Foresters (in collaboration with FAO). Copies obtainable only from: The Society of American Foresters, 425 Mills Building, 17th St. and Pennsylvania Avenue, N. W., Washington 6, D. C., U.S.A.	5.50	

SALES AGENTS FOR FAO PUBLICATIONS

Argentina	Editorial Sudamericana, S. A., Alsina 500, Buenos Aires.
Australia	Melbourne University Press, 369 Lonsdale Street, Melbourne, C.1.
Austria	Wilhelm Frick Buchhandlung, Graben 27, Vienna 1.
Belgium	Agence et Messageries de la Presse, 14-22 rue du Persil, Brussels.
Bolivia	Librería y Editorial "Juventud," Plaza Murillo 519, La Paz.
Burma	(*Wholesale*) Orient Longmans Private Ltd., 17 Chittaranjan Avenue, Calcutta 13, India.
Canada	Queen's Printer, Ottawa.
Ceylon	M. D. Gunasena and Co. Ltd., 217 Norris Road, Colombo 11.
Chile	Sala y Grijalbo Ltda., Bandera 140-F, Casilla 180D, Santiago.
Colombia	"Agricultura Tropical," Avenida Jiménez No. 7-25, Ofcs. 811/816, Bogotá; Librería Central, Calle 14, N. 6-88, Bogotá.
Costa Rica	Imprenta y Librería Trejos, S.A., Apartado 1313, San José.
Denmark	Ejnar Munksgaard, Norregade 6, Copenhagen K.
Ecuador	"La Hacienda," Escobedo No. 1003 y P. Icaza, Casilla No. 3983, Guayaquil; Librería Muñoz Hnos. y Cía., Apartado 522, Quito.
El Salvador	Manuel Navas y Cía., 1ª Avenida Sur 35, San Salvador.
Ethiopia	International Press Agency, P. O. Box No. 120, Addis Ababa.
Federation of Malaya	Caxton Stationers Ltd., 13 Market Street, Kuala Lumpur.
Finland	Akateeminen Kirjakauppa, 2 Keskuskatu, Helsinki.
France	Les Editions A. Pedone, 13 rue Soufflot, Paris 5e.
Germany	Paul Parey, Lindenstrasse 44-47, Berlin SW 61.
Greece	"Eleftheroudakis," Constitution Square, Athens.
Guatemala	Sociedad Económico Financiera, Edificio Briz, Despacho 207, 6ª Av. 14-33, Zona I, Guatemala.
Haiti	Max Bouchereau, Librairie "A la Caravelle," B. P. 111B, Port-au-Prince.
Hong Kong	Swindon Book Co., 25 Nathan Road, Kowloon.
Iceland	Halldor Jonsson, Mjostraeti 2, Reykjavik; Jonsson & Juliusson, Garöastraeti 2, Reykjavik.
India	(*Wholesale*) Orient Longmans Private Ltd., 17 Chittaranjan Avenue, Calcutta 13; Nicol Road, Ballard Estate, Bombay 1; 36-A Mount Road, Madras 2; Kanson House, 24/1 Asaf Ali Road, Post Box 386, New Delhi; Gunfoundry Road, Hyderabad 1; (*Retail*) Oxford Book and Stationery Co., Scindia House, New Delhi; 17 Park Street, Calcutta.
Indonesia	Pembangunan Ltd., 84 Gunung Sahari, Jakarta.
Iran	Bagher Shariat, Atabak Road, Ferdowsi Str., Tehran.
Iraq	Mackenzie's Bookshop, Baghdad.
Ireland	The Controller, Stationery Office, Dublin.
Israel	Blumstein's Bookstores Ltd., P. O. Box 4101, Tel Aviv.
Italy	Libreria Internazionale U. Hoepli, Galleria Piazza Colonna, Rome; A.E.I.O.U., Via Meravigli 16, Milan.
Japan	Maruzen Company Ltd., 6 Tori-Nichome, Nihonbashi, Tokyo.
Korea	The Eul-Yoo Publishing Co. Ltd., 5, 2-Ka, Chong-ro, Seoul.
Lebanon	Librairies Antoine, B. P. 656, Beyrouth.
Mexico	Manuel Gómez Pezuela e Hijo, Donceles 12, Mexico, D. F.
Morocco	Centre de Diffusion Documentaire du B.E.P.I., 8 rue Michaux-Bellaire, Rabat.
Netherlands	N. V. Martinus Nijhoff, Lange Voorhout 9, The Hague.
New Zealand	Whitcombe and Tombs Ltd., Auckland, Wellington, Hamilton, Christchurch, Dunedin, Invercargill, Timaru.
Nigeria	University Bookshop Nigeria Ltd., University College, Ibadan.
Norway	Johan Grundt Tanum Forlag, Karl Johansgt. 43, Oslo.
Pakistan	*East*: Orient Longmans Private Ltd., 17 Nazimuddin Road, Dacca. *West*: Mirza Book Agency, 9-A Shah Alam Market, Lahore.
Panama	Agencia Internacional de Publicaciones, J. Menéndez, Plaza de Arango No. 3, Panama.
Paraguay	Agencia de Librerías de Salvador Nizza, Calle Pte. Franco No. 39-43, Asunción.
Peru	Librería Internacional del Peru, S. A., Casilla 1417, Lima.
Philippines	The Modern Book Company, 518-520 Rizal Avenue, Manila.
Poland	Ars Polona, Krakowskie Przedmiescie, 7, Warsaw.
Portugal	Livraria Bertrand, S.A.R.L., Rua Garrett 73-75, Lisbon.
South Africa	Van Schaik's Book Store, Pty., Ltd., P. O. Box 724, Pretoria.
Spain	José Bosch Librero, Ronda Universidad 11, Barcelona; Librería Mundi-Prensa, Castelló 37, Madrid; Librería General Independencia, 8, Saragossa.
Sweden	C. E. Fritze, Fredsgatan 2, Stockholm 16; Gumperts A. B., Göteborg; Henrik Lindstahls Bokhandel, Odengatan 22, Stockholm.
Switzerland	Librairie Payot, S. A., Lausanne and Geneva; Hans Raunhardt, Kirchgasse 17, Zurich 1.
Taiwan	The World Book Company Ltd., 99 Chungking South Road, Section 1, Taipeh.
Thailand	Requests for FAO publications should be addressed to: FAO Regional Office for Asia and the Far East, Maliwan Mansion, Bangkok.
Turkey	Librairie Hachette, 469 Istiklal Caddesi, Beyoglu, Istanbul.
United Arab Republic	Librairie de la Renaissance d'Egypte, 9 Sh. Adly Pasha, Cairo.
United Kingdom and Crown Colonies	H. M. Stationery Office P. O. Box 569, London S. E. 1. *Branches at:* 13ª Castle Street, Edinburgh 2; 2 Edmund Street, Birmingham 3; Tower Lane, Bristol 1; 29 King Street, Manchester 2; 109 St. Mary Street, Cardiff; 80 Chichester Street, Belfast.
United States	Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N.Y.
Uruguay	Hector d'Elia, Oficina de Representación de Editoriales, Plaza Cagancha 1342, Montevideo.
Venezuela	Suma, S. A., Calle Real de Sabana Grande, Caracas; Librería Politécnica, Apartado del Este, 4845, Caracas.
Yugoslavia	Drzavno Preduzece, Jugoslovenska Knjiga, Terazije 27/11, Belgrade; Cankarjeva Zalozba, P. O. Box 41, Ljubljana.
Other countries	Requests from countries where sales agents have not yet been appointed may be sent to: Distribution and Sales Section, Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, Rome, Italy.

FAO publications are priced in U.S. dollars and pounds sterling. Payment to FAO sales agents may be made in local currencies.

TIPOGRAFICA CASTALDI - ROMA - 1961